



ETS Observatory

Report 2 version 5.1

Data up to March 2026

July 2026

Puertos del Estado



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Executive Summary

- The **Report examines global container traffic from January 2023 through March 2026**, drawing on data from the ETS Observatory and applying a methodology that combines indicator-based analysis with a discrete choice modelling framework.
- The **EU Emissions Trading System (EU ETS) introduces additional costs for shipping companies**. The Report assesses two potential avoidance strategies: **(1) route transformation**—that is, calls at ports in neighbouring non-EU countries when entering or exiting the EU maritime area; and **(2) route splitting**—the division of an original service into two distinct legs, whereby deep-sea vessels call at hub ports located in countries neighbouring the EU.
- **To detect possible carbon leakage, the analysis follows a multi-stage approach**. The first stage (**detection**) examines shifts in traffic patterns at both port and national level, identifies different forms of carbon avoidance, and reviews selected routes and shipping lines. The second stage (**attribution**) evaluates, on a case-by-case basis, the potential drivers behind observed route changes, including congestion, costs, and other relevant factors.
- To identify changes in traffic patterns, the **report introduces the TEU mile indicator** at port level, defined as the carrying capacity of vessels calling at a given port multiplied by the distance sailed on their inbound or outbound leg. As complement, other indicators and the **container tracking data source** qualifies the hub/gateway behavior evolution of the major ports involved in deep-sea routes with indicators such as **transshipment** volumes and **direct connectivity ratio**.
- **Besides the entry into force of the EU ETS for maritime transport, the analysis takes into account two major developments** that have disrupted trade flows between Europe, Asia, and the Middle East: **(i) the disruption of traffic through the Suez Canal**, linked to the Houthi conflict from late 2023 onwards, which coincided with the application of the EU ETS to maritime transport in January 2024; and **(ii) the expiry of the Consortia Block Exemption Regulation (CBER)**, which became effective on 25 April 2024.
- The closure of the Suez Canal and the restructuring of the marine alliances and the to a reorganisation of maritime routes and shipping alliances. However, **these factors alone cannot account for the growth in transoceanic connectivity currently being observed in countries such as the United Kingdom and Egypt**. Nor does this growth appear to be attributable to congestion, service quality issues, or capacity constraints at EU ports, or to a sharp rise in import/export activity in neighbouring countries. Equally, there is no clear evidence of a significant reduction in operating costs at non-EU ports — particularly not at UK ports — that might explain this development.
- **A discrete choice model has been developed to statistically assess the extent to which the additional costs generated by the EU ETS have influenced observed route reconfigurations**. The current analysis focused on major ports at risk across Northern Europe, the Atlantic region, and the Mediterranean basin. The model indicates an important significance (76%) of the EU ETS cost as a variable to explain the changes of the maritime routes.

Executive Summary – 2/2

❖ Main research results:

1. **Sustained losses in deep-sea connectivity at Eastern Mediterranean EU ports**, materializing mainly through route splitting, with a greater share of containers are received via feeder from non-EU ports, mainly Egypt.
2. **UK ports** have gained a significant share of deep-sea traffic mirrored by a combined loss of Rotterdam and German ports. This shift is not related to an increase of import/export or transshipment activity.
3. **Pure relay transshipment** traffic, where EU ports connect two remote regions, **has halved at the EU West Med hubs since 2023 (–51 %), while Tanger Med holds steady (+5 %).**
4. Overall, **European ports are losing a 5% share in the growing transshipment market (+25%)** in the Mediterranean region.
5. This loss of connectivity at EU ports could ultimately translate **into a broader decline in the competitiveness of the EU economy**, as well as a **reduced degree of direct control over the maritime supply network** that currently serve the European Single Market.
6. To mitigate such effects **this report introduces two mitigation proposals to adjust the regulation** to avoid carbon leakage, secure European supply chain and preserve EU ports competitiveness.

7. **Significant new investments in port capacity are planned in the UK, as well as in the Eastern Mediterranean, notably in Israel, Turkey, and Egypt.** Planned investments in East Med ports in 2021-2020 is estimated in 5.740 BM € and 18 M TEUs handled per year, 88% of which falls on non-EU ports. In the United Kingdom, new investments are expected to expand nominal capacity by 21% in the same period. This substantial investments undertaken to expand port capacity in the United Kingdom, the Eastern Mediterranean, in the West Med and Atlantic points towards structural shifts rather than cyclical or short-term adjustments.
8. A discrete choice model developed to statistically assess the influence of the EU ETS on the route reconfigurations indicates that the **EU ETS cost explains the 76% of the route changes.**
9. Moreover, it is important to recall that in certain regions - as is the case in the Mediterranean - maritime transport competes directly with road haulage. **The inclusion of maritime transport in the EU ETS, in the absence of an equivalent measure for road transport, creates a competitive disadvantage for ro-ro traffic. This imbalance risks undermining the long-standing EU policy of promoting and developing “Motorways of the Sea,”** an initiative the European Commission has supported for several decades as part of its strategy to foster more sustainable and integrated transport networks.

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Introduction

Since 1 January 2024, merchant vessels with a gross tonnage of 5,000 GT or more have fallen within the scope of the European Union Emissions Trading System (EU ETS).

For large container vessels operating between Europe and Asia via the Cape of Good Hope, the legislation is estimated to increase the cost of a voyage by between €400,000 and €500,000.

The scale of this additional cost creates a significant risk that shipping lines may alter the routing and configuration of their container services in order to avoid or reduce their exposure to the EU ETS. Such reconfiguration could take two principal forms:

- **Changes to port rotations:** whereby the first or last EU port of call or both would be relocated to a neighbouring non-EU country.
- **Segmentation of deep-sea service:** whereby the main route would call at a hub port located in a neighbouring third country and would be supplemented by one or more short-medium distance services connecting that hub with EU ports.

These scenarios are considered plausible for the following reasons:

- **Market competition.** The container shipping market is highly price-competitive, encouraging shipping lines to adopt cost-optimisation strategies to improve the competitiveness of their freight rates.

- **Mobility of transshipment traffic.** Transshipment flows have only a limited connection with local import and export activity. Consequently, such traffic can be relocated relatively easily between ports because of their respective operating costs and relative efficiency.
- **Limited availability of alternative fuels.** Although low-carbon fuels may partly mitigate the costs associated with the EU ETS, their limited availability and uncertainty regarding their cost competitiveness on deep-sea routes encourage carriers to seek alternative operational solutions to reduce emissions covered by the system.
- **Port capacity in neighbouring third countries.** Investment in ports located in countries neighbouring the EU has increased both their ability to accommodate ultra-large container vessels (ULCVs) and the capacity of their terminals. These improvements facilitate the development of transshipment hubs outside the EU that are connected to the main deep-sea shipping corridors.

Furthermore, the inclusion of maritime transport within the EU ETS, in the absence of an equivalent measure for road freight transport, could result in a modal backshift from short-sea shipping — particularly ro-ro services — to road transport

Introduction

The potential reconfiguration of maritime transport networks in order to avoid or minimize the impact of the EU ETS could give rise to several adverse effects:

- *Environmental effectiveness.* The relocation of port calls and cargo flows could reduce the effectiveness of the EU ETS as an emissions-mitigation instrument, particularly where operational changes generate additional journeys or shift emissions beyond the geographical scope of the system.
- *Economic competitiveness.* A gradual loss of direct connectivity with the main deep-sea trade routes could increase logistics costs and delivery times. This would, in turn, reduce the competitiveness of ports, businesses and, more broadly, the economies of EU Member States.
- *Economic security.* Greater reliance on hub ports located outside the EU could weaken European economic security by reducing control over critical segments of the supply chains serving the internal market.
- *External transport costs.* A potential shift of freight from short-sea shipping to road transport could increase transport-related external costs, including emissions, road congestion, accidents and the deterioration of land-based infrastructure.

Against this background, the Observatory's second report introduces the following developments compared with the first report, published during the first quarter of 2026:

- *Extended time horizon.* The period covered by the analysis has been extended from 2023 to the first quarter of 2026.
- *Broader geographical scope.* The number of countries included in the Eastern Mediterranean area has been increased, while developments in traffic flows in the Western Mediterranean are examined in greater detail.
- *Incorporation of new datasets.* A new source of data has been added, enabling maritime routes and container flows to be analyzed with greater precision.
- *Analysis of ro-ro traffic.* The report examines developments in ro-ro traffic between Spain and Italy, with particular attention to the potential shift of freight towards road transport.
- *Recalibration of the container route-choice model.* The selection of routes used to estimate the model has been reviewed, and its parameters have been recalibrated in order to improve its explanatory capacity.
- *Proposed measures.* The report proposes measures aimed at reducing the risk of container maritime routes being altered or segmented for the purpose of avoiding or limiting exposure to the EU ETS.

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EU ETS avoidance strategies

Asia–Europe vessels under alternative routing and gateway choices: Suez versus the Cape of Good Hope, and an EU port versus a non-EU port. The gateway decision creates a differential cost, around €260k–€335k via Suez and €370k–€476k via the Cape. The scale of this additional cost creates a significant risk that shipping lines may alter the routing and configuration of their container services in order to avoid or reduce their exposure to the EU ETS.

MSC AURIGA (2020)

Cat 4 New Panamax | MSC | 13,632 TEU | 149,525 GT | 778 kg CO2/nm

Scenario A: Suez routing (2023)

	SGP → Rotterdam (Suez)	SGP → Felixstowe (Suez)	Δ
Miles (nm)	8.354	8.288	-66
Fuel consumption (t)	2.087	2.071	-16
Emissions (t CO2)	6.499	6.448	-51
Fuel cost (€)	907.914	900.741	-7.173
ETS cost (€)	259.976	0	-259.976
ETS / Fuel	28,6%	0,0%	

Scenario B: Cape of Good Hope routing (2025)

	SGP → Rotterdam (Cape GH)	SGP → Felixstowe (Cape GH)	Δ
Miles (nm)	11.896	11.833	-63
Fuel consumption (t)	2.972	2.956	-16
Emissions (t CO2)	9.255	9.206	-49
Fuel cost (€)	1.292.859	1.286.012	-6.847
ETS cost (€)	370.204	0	-370.204
ETS / Fuel	28,6%	0,0%	

Cape routing amplifies ETS cost by +42% vs Suez (259,976€ → 370,204€)

EVER GREET (2019)

Cat 5 ULCV | EVERGREEN | 19,982 TEU | 219,688 GT | 1,001 kg CO2/nm

Scenario A: Suez routing (2023)

	SGP → Rotterdam (Suez)	SGP → Felixstowe (Suez)	Δ
Miles (nm)	8.354	8.288	-66
Fuel consumption (t)	2.685	2.664	-21
Emissions (t CO2)	8.362	8.296	-66
Fuel cost (€)	1.168.152	1.158.923	-9.229
ETS cost (€)	334.494	0	-334.494
ETS / Fuel	28,6%	0,0%	

Scenario B: Cape of Good Hope routing (2025)

	SGP → Rotterdam (Cape GH)	SGP → Felixstowe (Cape GH)	Δ
Miles (nm)	11.896	11.833	-63
Fuel consumption (t)	3.824	3.804	-20
Emissions (t CO2)	11.908	11.845	-63
Fuel cost (€)	1.663.434	1.654.625	-8.809
ETS cost (€)	476.316	0	-476.316
ETS / Fuel	28,6%	0,0%	

Cape routing amplifies ETS cost by +42% vs Suez

Parameters: VLSFO €435/t (\$500 @ 1.15 USD/EUR) · ETS €80/tCO2 · 50% of voyage emissions (SGP stands for Singapore).

EU ETS avoidance strategies

Identify EU ETS avoidance strategies: structural modifications of container shipping routes intended to circumvent or mitigate the impact of the EU ETS on carrier operating costs

Route Transformation: Port calls at neighbouring-country ports when entering or exiting the EU maritime area. This strategy does not break the continuity of the service, as the same vessel covers both the transoceanic leg and the EU access or exit leg.

In certain cases, this practice may be discouraged by designating ports located in third countries as “neighbouring container transshipment ports,” in accordance with the procedure laid down in Article 3ga of Directive 2003/87/EC, as inserted into that Directive by point 7 of Directive (EU) 2023/959.



EU ETS avoidance strategies

Route Split: The strategy consists of splitting the original route into two distinct legs. Transoceanic vessels call at hub ports in neighbouring countries. From these locations, cargo is distributed to or consolidated from neighbouring countries via feeder vessels. This setup decouples EU-ports from the main deep-sea routes.

This strategy allows transoceanic (deep-sea) services to operate entirely outside the scope of the EU, thereby falling outside not only the EU ETS but also the rest of the regulatory obligations under the Fit for 55 legislative package. Moreover, this form of evasion cannot be neutralized through the designation of neighbouring container transshipment ports.



- Hub
- Deepsea call
- Feeder call



EU ETS avoidance strategies

Modal backshift from sea to road: freight previously carried by sea through roll-on/roll-off maritime services returns to a fully road-based transport model.



EU ETS avoidance strategies

Additional factors influencing the Detection of EU ETS avoidance strategies

Expiration of the CBER

Effective April 25, 2024, the European Commission discontinued the renewal of the Consortia Block Exemption Regulation (CBER). This framework previously permitted shipping lines to establish cooperation agreements that, under specific conditions, were exempt from the antitrust regulations applicable within the European Union.

Red Sea Crisis

In late 2023, following attacks on maritime traffic in the Red Sea, shipping lines diverted from the Suez Canal to the Cape of Good Hope route.

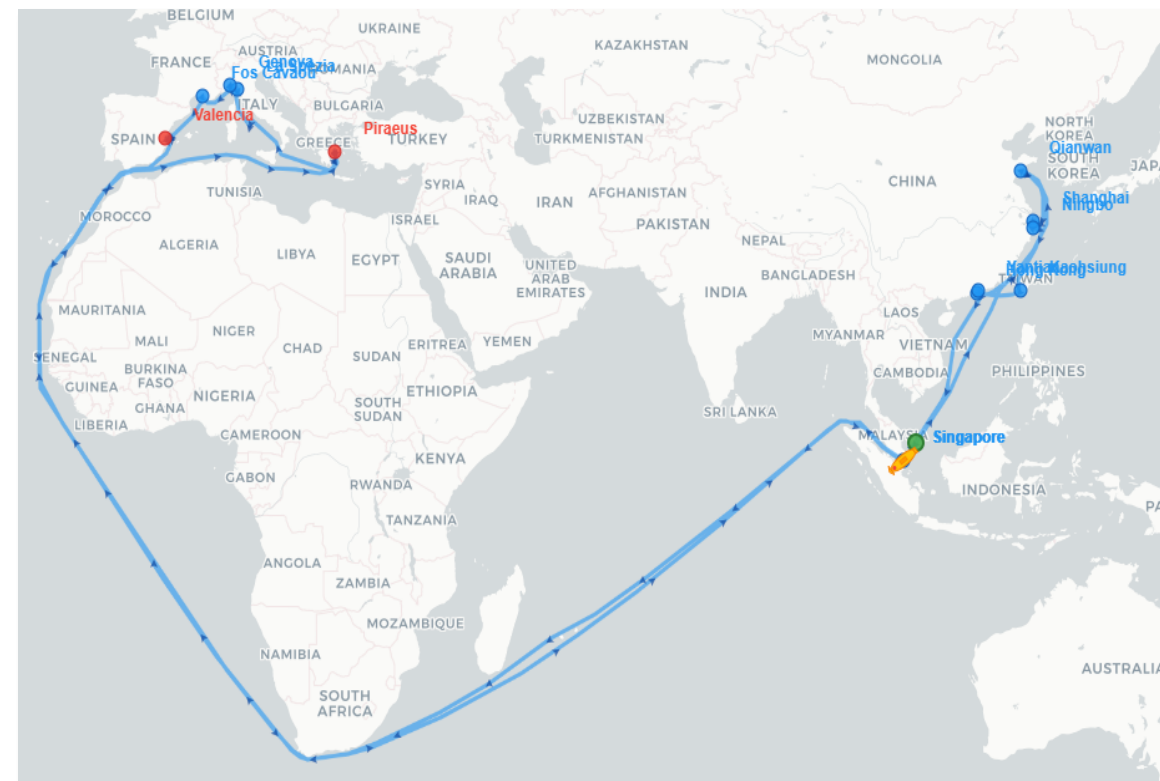


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Conceptual Framework & Methodology

To effectively monitor the impact of the EU ETS, the Observatory employs a methodology structured in two sequential phases: **Detection** and **Attribution**. This structure is designed to move from the identification of anomalies compatible with carbon leakage to the verification of their causes

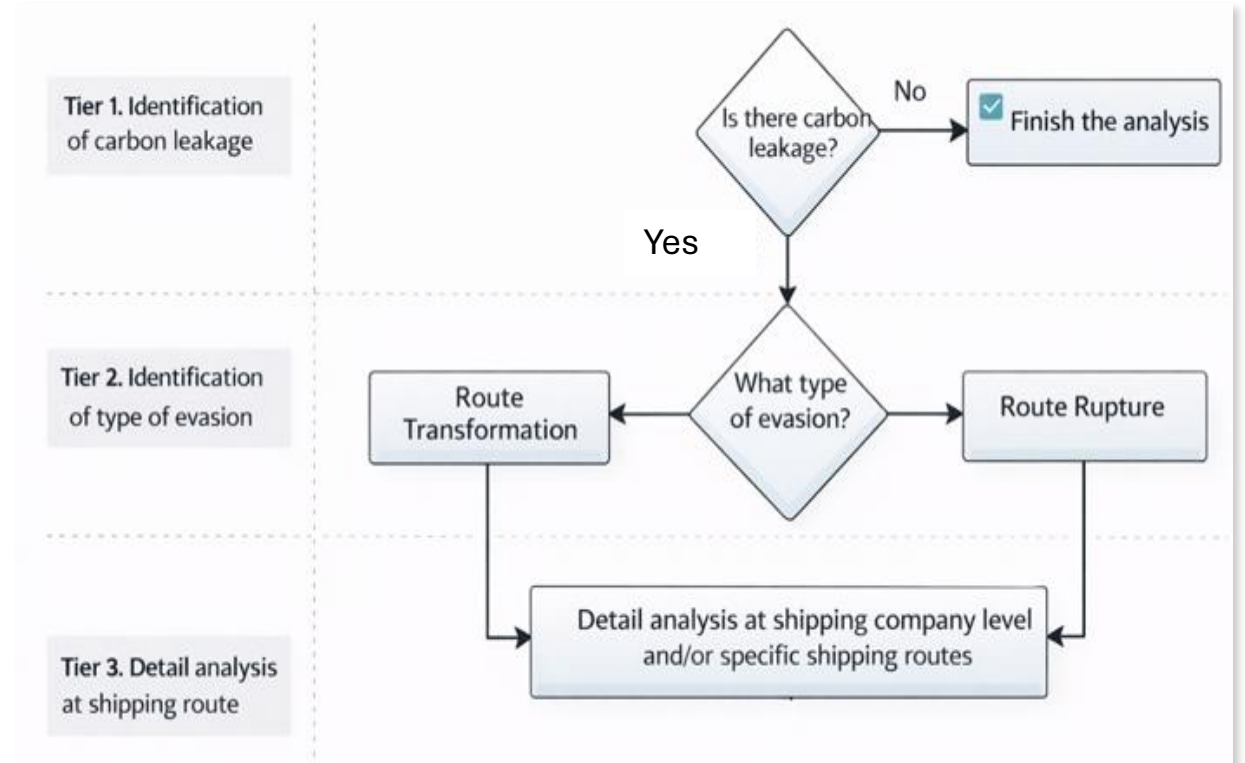
Phase I - Detection

A dynamic monitoring system designed to systematise the identification of potential carbon leakage in a structured manner.

Tier 1: High-Level Port activity. Flags significant shifts in cargo flows, vessel traffic, and throughput volumes between EU ports and neighbouring non-EU competitors to identify the existence of carbon leakage.

Tier 2: Network Level structural metrics. Analyses the underlying changes in the shipping network, such as transshipment ratios, LSCI, and hub-and-spoke configurations. The main goal of this step is to identify the type of EU ETS avoidance strategy.

Tier 3: Voyage-Specific behavioural metrics. Provides granular real-world illustrations of the detected trends by analysing individual ship voyages (e.g., relay calls) to confirm hypotheses and facilitate dissemination.



Conceptual Framework & Methodology

Indicators

Tier	Objective		Datasets	Indicator	Expected trend in case of carbon leakage		Geographical Area
					European	Non-European	
1	High-Level Activity Metrics	Identification of potential carbon leakage	Container tracking data-set (AIS and MRW data-set)	$KTEU\text{-mille} = \sum (TEU_i \times Miles_i) \times 10^{-3}$	▽	△	Europe and Europe +
2	Network-Level Structural Metrics	Route Transformation	Vessel tracking data-set Container tracking data-set	Transshipment Ratio (**)	▽	△	Ports
				Number of port calls of vessels coming directly from outside of Europe	▽	△	
		Route Splitting	Vessel tracking data-set Container tracking data-set	Transshipment Ratio (**)	-	△	Ports
				kTEU-mile non-European	-	△	
				Direct Connectivity Ratio	▽	-	
				kTEU-mile	▽	-	
				Transshipment	▽	-	
3	Voyage/Shipping company-Specific Behavioural Metrics	Examples of specific routes of shipping companies	Vessel tracking data-set	Based on the available information			Ports / Shipping Companies

The indicators used in each tier for the detection phase. (*) Only applicable when a European hub port is replaced by a non-European one, but the configuration itself (hub-and-spoke) has not changed due to the ETS application. (**) Now using container tracking dataset

Conceptual Framework & Methodology

Phase II - Attribution

A validation framework to differentiate organic market dynamics from regulatory arbitrage, recognizing that correlation does not imply causation. Therefore, this second phase systematically analyses alternative factors (e.g., economic trends, infrastructure changes, or labour disputes, etc.) that could independently explain the observed deviations. Two main approaches will be used:

Level 1: Expert Assessment. To systematically map observed anomalies against known confounding factors to isolate the ETS effect: Economic Activity, Operational Costs, Port Infrastructure, Congestion, Geopolitical and Regulation and ETS Cost Savings.

Level 2: Advanced Quantitative Verification. Identified cases will be simulated by a discrete choice transport model to further qualify ETS attribution with a certainty level of statistical certainty.

EU ETS as a main reason or main driver

It is relevant to distinguish between situations in which ETS avoidance constitutes the primary driver of route-related decisions and those in which the ETS influences the choice among alternative solutions without being the main underlying cause.

The implementation of the ETS has coincided with significant structural shifts in the maritime transport sector, including the formation of new shipping alliances and disruptions to traffic through the Suez Canal, among other developments. In this context, the Red Sea crisis has been the immediate trigger for the reconfiguration of many routes. ***The EU ETS, therefore, cannot be regarded as the root cause of those changes; however, it may well have played a meaningful role in shaping the final service configurations, which were almost certainly designed to optimize overall operating costs.***

Accordingly, it is necessary to clearly differentiate between cases where the ETS constitutes the principal explanatory factor for changes in maritime services and cases where it acts as a secondary or enabling factor influencing route adjustments that are predominantly driven by other structural elements, such as the new shipping alliances.

Conceptual Framework & Methodology

In the attribution phase the following approach will be applied to figure out the main reasons for the route changes

Level	Attribution	Macroeconomic Control Indicators	Objective
1	Economic activity	World Bank, IMF, UNCTAD, COMTRADE	Analyse economic fundamentals, country and regional comparison
	Operational Costs	Market research	Detect alterations on port operational costs: labour, THC, port services, port dues
	Port Infrastructure	Market research	Identify infrastructure and superstructure investments, and plans
	Congestion	Data Platform Market research CPPI	Ability to execute planned schedules on time not distorting the line committed lead times, nor incurring in extra costs
	Geopolitical and Regulation	Market research	Other external causes that could influence the route design or the port choices
	ETS cost savings	Data Platform Market research	Identify the ETS cost savings for a certain service under current market conditions
2	Quantitative verification	ETS Observatory simulation model	Validate potential evasion strategies using the internal calibrated logit model

Conceptual Framework & Methodology

EUROMED and EUROMED GATEWAYS



- **EEA**
Ports in EU Member States.
 - **EEA+**
Ports in EU neighboring countries located within 300 nautical miles.
 - **EUROMED**
Ports in the EEA and EEA+ regions.
 - ⇒ **EUROMED Gateway calls = DEEP-SEA calls**
Calls at EUROMED ports by vessels operating on transoceanic (deep-sea) routes.
- These routes are of particular interest, as they are the ones most exposed to the risk of reconfiguration because of the EU ETS.
- TEU miles of gateway port considers only the deep-sea leg.

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ETS Data Monitoring System

The system integrates global AIS and port geofencing with vessel master databases to establish a real-time digital twin of the fleet. Crucially, it layers official carriers' details and reported emissions collected by EMSA/MRV to create a baseline for operational and regulatory auditing

Core Data Platform

- **Global AIS Positioning:** Real-time worldwide vessel tracking (Automatic Identification System).
- **Vessel Master Database:** Comprehensive registry of vessel characteristics and static data.
- **Port Geofencing:** Precise location data for port boundaries and terminals.
- **Reported Emissions (EMSA):** Vessel-specific emissions data based on European Maritime Safety Agency standards declared per vessel operator.
- **Carrier & Service Intelligence:** Detailed information on shipping lines and their specific service loops and alliances.

Proprietary Algorithms & Data Processing

- **Port Call Detection:** Automated identification of vessel arrivals and departures.
- **Distance Sailed:** Calculation of actual nautical miles travelled.
- **Technical Stops:** Identification of non-commercial stops (e.g., bunkering, maintenance).
- **Route Classification:** Categorization of vessel movements by trade lane or route.
- **ETS Emissions Modelling:** Calculation of CO2 emissions and associated costs under the Emissions Trading System (EU ETS) rules.

Container Tracking Dataset*

- **Container-voyage tracking dataset :** each box traced origin → hub → final destination, refreshed weekly into a live cube with data-quality indicators.
- **Measures: cargo journeys:** not vessel capacity: export/import/transshipment TEU per port, hub-vs-gateway roles, service/operator attribution. Global reach.
- **Transshipment lens:** each port's relay business and its drift between EU and non-EU hubs.
- **Import/export-flow lens:** classifies each flow as direct or relayed, locating the transshipment in the remote origin region or in the destination region — down to destination port and feeding hub.

ETS Data Monitoring System

Indicators

Indicator	Formula	Description
Calls	$\sum_{time,i} (IMO + start Date) i$	Unique vessel port visits over a period, excludes non-cargo stops, bunkering, shipyard, etc. Port calls are identified by IMO number and call start date.
Gateway Calls	$\sum_{time,j gateway} (IMO + start Date) j$	Gateway call arrived from or departed to a port outside the EUROMED (North Europe, Atlantic, West Med and East Med), for example Asia, North America, etc.
TEUs	$\sum_{calls} (vessel TEU Capacity)$	Total TEU capacity of the vessels calling at a port, not the actual TEU throughput measured in terminal operations.
Miles	$\sum_{calls} \frac{(previous Leg + Next Leg)}{2}$	Distance sailed: for each port call, the distance sailed from previous port and towards next destination. It is divided by 2 to avoid double counting.
kTEUmile	$\sum_{calls} \frac{(TEU \times miles)}{1000}$	Defines the transport work, for every call accounts the TEU capacity of the ship times the distance travelled. It is shown in thousands to reduce figure size.
kTEUmile share	$\frac{kTEUmile_i}{\sum kTEUmile_{Total}}$	Transport work share: transport work of a port as % of the transport work of a set of ports over time.

ETS Data Monitoring System

Indicators

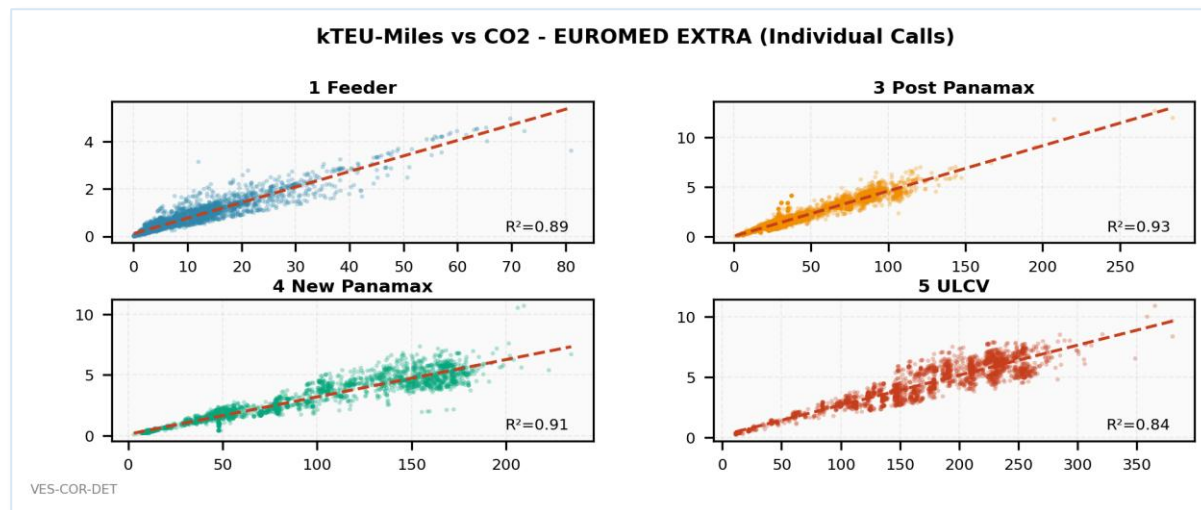
Indicator	Formula	Description
CO2nm	$\frac{\text{vessel CO2 emissions}}{\text{miles sailed}}$	Emission factor reported annually by vessels visiting EU ports according to MRV regulation and Delegated Acts. This value is published by EMSA. The system projects values for non reported years based on last report or similar vessel characteristics.
CO2	$\sum f(\text{CO2 nm, year}) \times \text{miles}$	A calculation of actual CO2 emission combining annual reported (or estimated) emission factor multiplied by actual (AIS recorded) miles sailed . From 2024 onward CO2 refers to CO _{2eq}
ETS cost	$f(\text{EU Allowances, Year, CO2})$	The ETS cost uses a fixed annual value for carbon allowances (€/t), the CO2 emissions and the ETS rules applied to the vessel port of origin and destination and transparent ports.
Transhipment ratio	$\frac{\text{TEU transhipped}}{\text{Total TEU operated}}$	The tracked container dataset determines whether an operation at port is import/export or transhipments. TEUs are estimated.
Direct connectivity ratio	$\frac{\text{DIRECT imports}}{\text{TOTAL imports}}$	Determines when a container travelled from origin port to destination on the same vessel or changed at transhipment ports. DIRECT voyages had no transhipments in the EUROMED region.

ETS Data Monitoring System

K TEU mile or Transport Work (TW)

A useful indicator to identify potential carbon leakage:

- The **kTEUmile** is a **proxy for CO2 emissions** since it maintains a direct correlation with emissions. Energy consumption is proportional to the distance travelled and is directly related to vessel size. In turn, energy consumption has a direct relationship with emissions.
- The metric is also strongly influenced by modifications in shipping routes or the type of vessels deployed, is **an indicator of long-distance connectivity**.
- Ports involved in long distance voyages with transoceanic destinations will show high values of kTEUmile, while not necessarily rank high in TEU capacity. Germany, for instance, ranks first in TEU capacity but is fourth in kTEUmile among the North European countries.

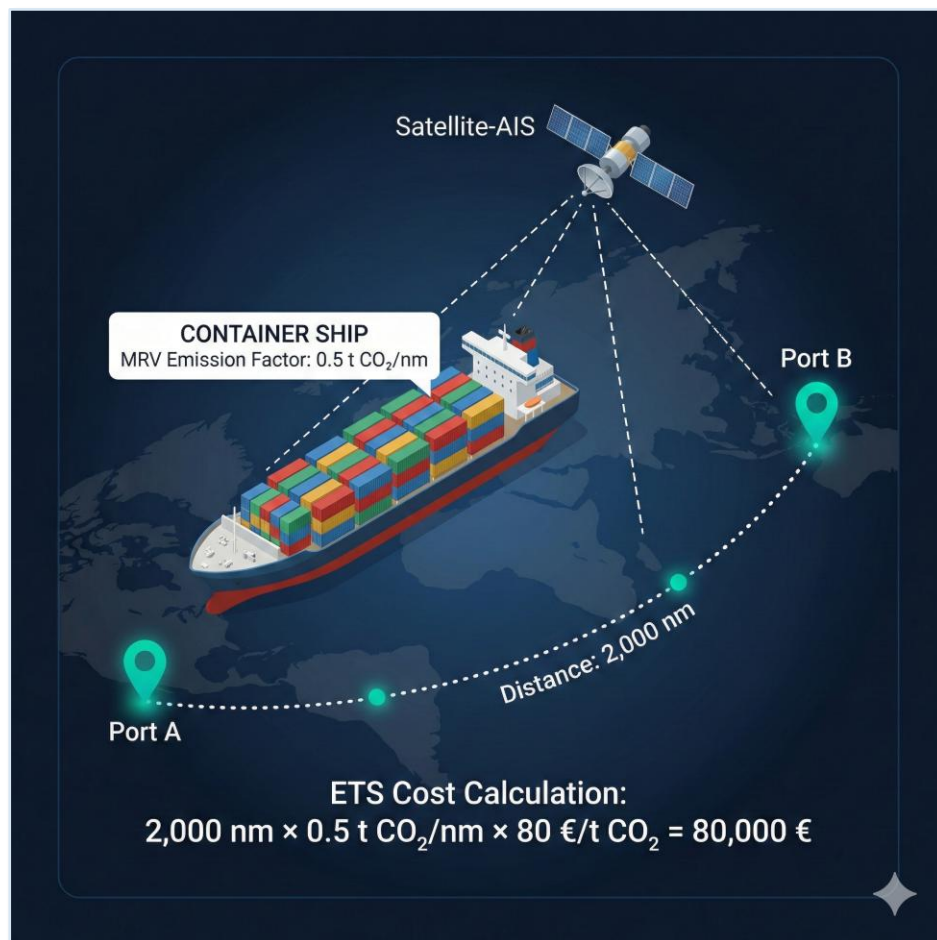


Regression lines of kTEUmile vs CO2 emissions per vessel category
EU ETS Observatory own elaboration

The dimensionless measure **TW share (or share TEU_mile)**, expressed as TW_i / TW_n reflects the relative weight of an element i , over a set of n elements. Useful to track relative weights of when either TEU capacity is changing (due to economic activity or seasonality) or the distance is changing (as is the case with the closing of the Suez Canal. It helps for instance identify a port losing transport share among its group while its TW is growing.

ETS Data Monitoring System

Emission modelling and ETS Cost estimates



The Observatory's Data Platform leverages real-time AIS tracking to calculate actual distances sailed by every vessel, enabling precise CO₂ emissions estimation and EU ETS cost projections at any level of granularity, from a single ship to a shipping company or the entire European trading system, for container ships and other fleets.

Tracking & Distances

- AIS position recording for all vessels.
- Actual nautical miles calculated between each port call.
- Foundation for emissions estimation.

Emissions Data Source

- Latest MRV data published by EMSA.
- Currently using 2024 data; 2025 applies previous year's emissions.
- Automatic correction of 2025 values and 2026 projections when 2025 data is published.
- The Data Platform is **calibrated against each MRV annual publication**.

ETS Methodology

- Cost factor: €80/ton CO₂ (from 2023, applicable 2024-2025).
- Calculation per EU ETS regulation.
- Includes transparent port adjustment.

Calculation Capabilities

- CO₂ emissions: All vessels operating in Europe and worldwide.
- Granularity: Vessel → Fleet → Company → Zone → Full ETS system.
- Daily emissions tracking.

ETS Data Monitoring System

Container Tracking Dataset

The Observatory's Data Platform incorporates EconDB's *Container Tracking Dataset** that reconstructs the journey of each container from port-call events: at every call, the system records which cargo is loaded onto and which cargo is discharged from the vessel. By chaining those events, it traces the container's complete itinerary and thereby distinguishes traffic that actually enters or leaves a market from traffic merely passing through.

Events and tracing

- Each vessel call generates load and discharge events.
- Chained events rebuild the full container journey.
- Transshipment kept separate from imports and exports.

Nature of the data

- Container-vessel port calls worldwide since 2022.
- Volumes in TEU, checked vs official port statistics.
- Confidence indicators show share of traffic traced.

Analysis capabilities

- Port role: transshipment hub vs gateway.
- Volumes per port: transshipment, imports, exports.
- Direct vs indirect flows through Med hubs.
- Trade corridors: origin–destination pairs.
- Carbon leakage: EU-to-non-EU hub shifts.
- Liner services, operators and feeders.

MRKU4976376 | 40' Dry High Last updated: 18 hours ago ⓘ

Estimated arrival date	Latest event
29 Jul 2026 21:00	Vessel departure • SURABAYA, INDONESIA • 12 Jul 2026

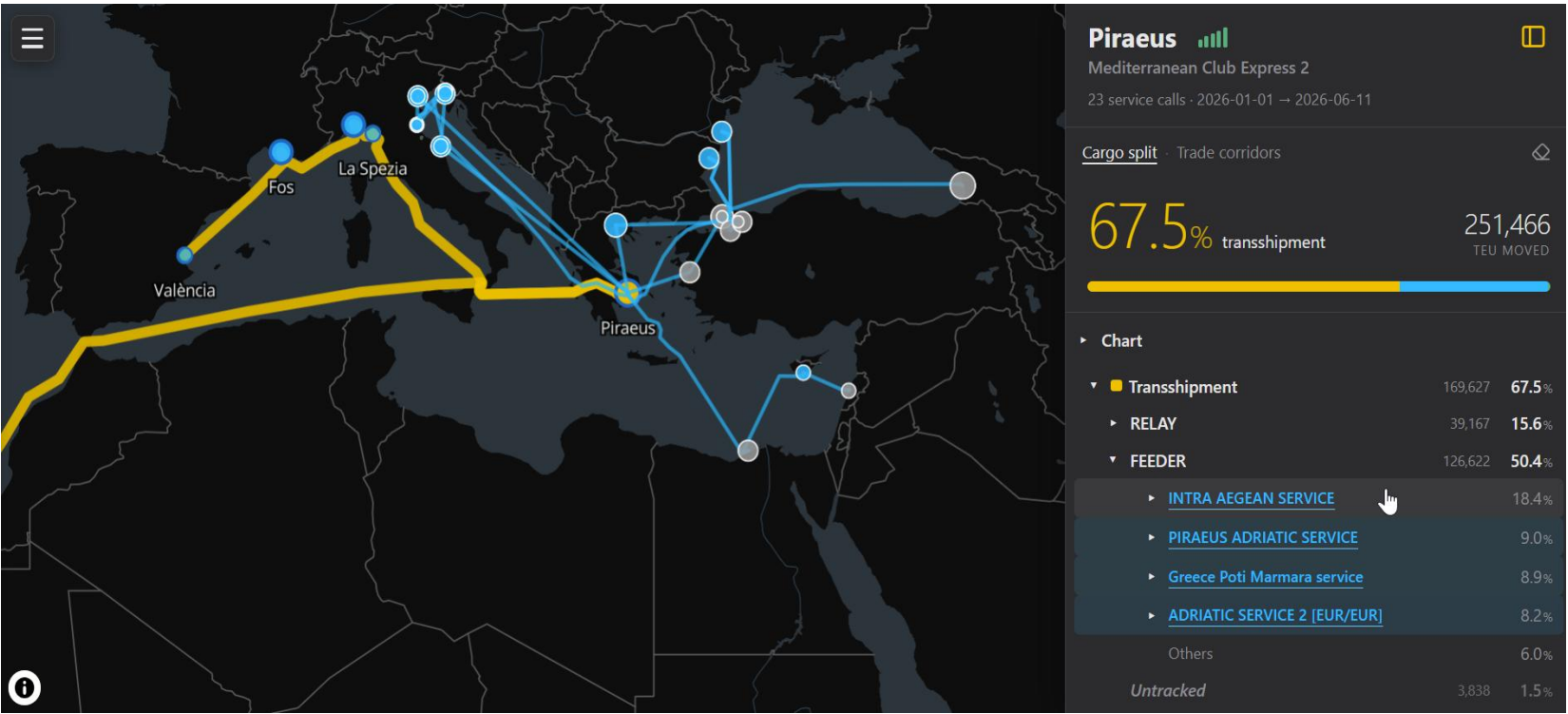
Note: All times are given in local time, unless otherwise stated.



Data monitoring System: Container tracking

The Observatory's Data Platform incorporates the Container Tracking Dataset from EconDB that follows individual containers along their journey, port by port. Normal port statistics tell you how many containers moved through a port. They don't tell you where those containers came from, where they were going, or whether the port was their destination at all.

By following each box from where it was first loaded to where it was finally delivered, this dataset separates what a port really does: cargo that enters the local market, cargo that leaves it, and cargo that is simply changing vessel on its way somewhere else. It also shows which markets a hub serves, and whether a port receives its imports directly from origin or through a previous stop at another Euromed port — the direct connectivity ratio (see Euromed definition ahead).



The chart on the left shows how this dataset makes it possible to identify the way several maritime services are integrated at the same port, thereby revealing the connections between deep-sea shipping lines and other deep-sea (relay transshipment) or feeder services.

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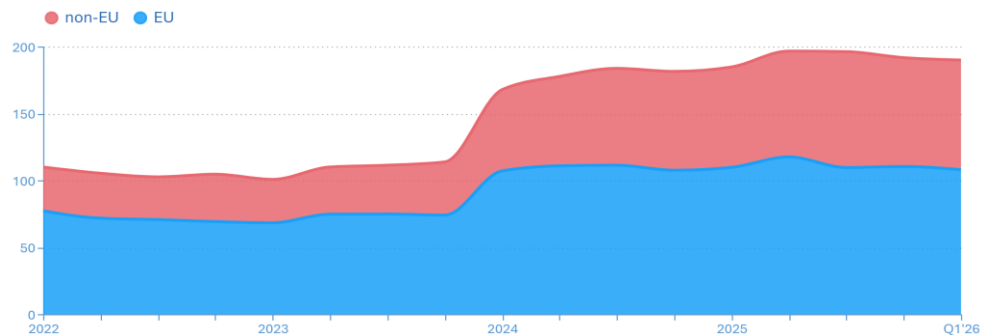
[About the EU ETS Observatory](#)

Detection of Potential Carbon Leakage

Monitoring the relative share of transport work, measured in kTEU miles, between EEA and EEA+ ports at EUROMED gateways

EUROMED DEEP-SEA TRAFFIC

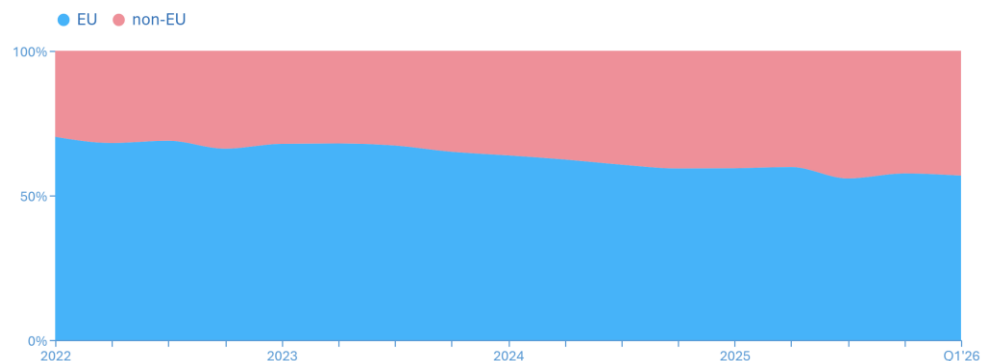
kTEU·miles (M)



- In December 2023 the Houthis crisis that meant practically the closing of the Bab el-Mandeb strait, created a shock on maritime transport affecting directly the Asia, India and Middle East trade with Europe.
- The top chart shows the **impact in kTEU mile** in both the EEA and the EEA+ ports after the crisis. The **new route required between 2 and 3 additional sailing weeks to connect the Asian markets with Europe**. The shipping companies managed to respond not only increasing the fleet employed and incrementing sailing speed but also restructuring many of the services.

EUROMED DEEP-SEA TRANSPORT WORK SHARE

kTEU·miles (%)



- Transport work measured in TEU miles supported by the EUROMED gateway ports shows, over the same period, a **steady erosion of the EU share**, with non-EU ports continuously gaining ground — from around 33% in 2022 to over 43% by Q1 2026, gaining 10 pp share.
- While the shock wave of the crisis is clearly visible in the top chart (increased TEU miles) , **the evolution of the TW share shows a continuous decrease**, from 2022 to first quarter of 2026.

Detection of Potential Carbon Leakage

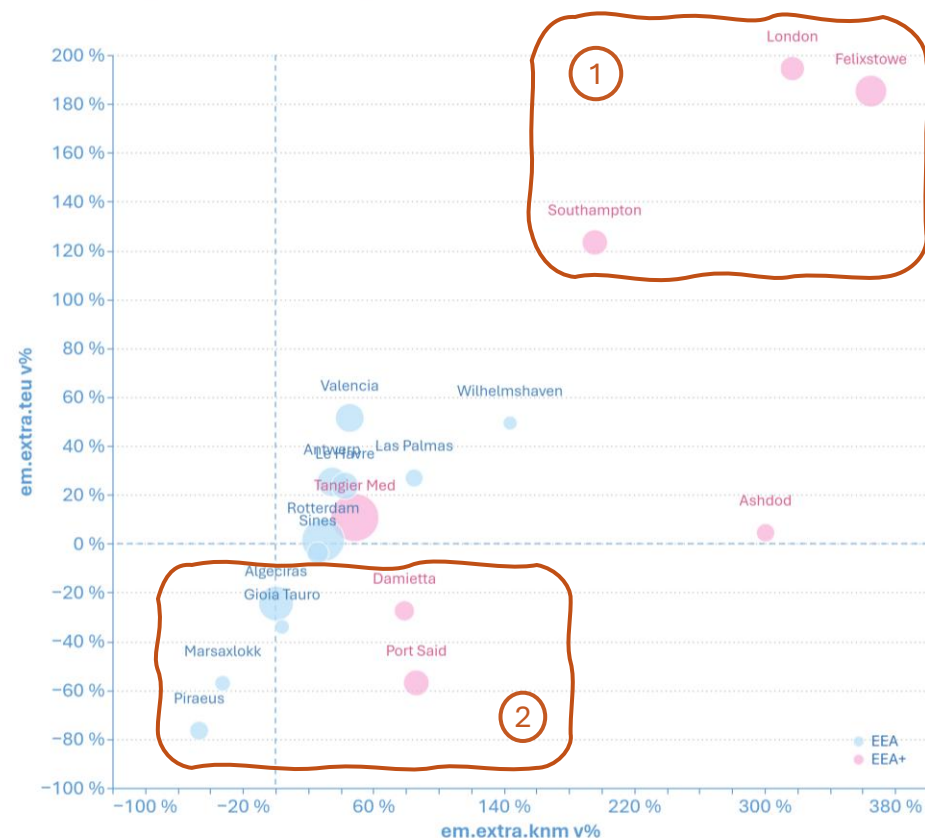
Statistical divergences found from 2023 to Q1 2026

Main EEA and EEA+ ports

TEU variance vs miles variance. Bubble size = k TEU mile

Main EEA and EEA+ GATEWAY ports

k miles v% vs TEUs v% · size = kTEU·miles · 2023 → 2025-26



The chart on the left deconstructs the **kTEU miles** metric into its two primary components: **distance** (nautical miles) on the x-axis and **vessel capacity** (TEUs) on the y-axis. Representing growth compared with 2023.

While most ports saw an increase in mileage due to the Suez Canal rerouting, the rate of growth varied significantly. Variations in TEU capacity — with some ports expanding and others contracting — have created statistical anomalies that demand detailed examination:

1. United Kingdom: The three major UK ports lead the growth in connectivity (miles) and TEU capacity.
2. East Mediterranean: Piraeus exhibits a decline in both TEU capacity and distance. Conversely, Port Said showed resilience despite losing volume, it managed to increase its mileage by 86% during the same period.

Both instances indicate a **transfer of maritime activity** toward **EEA+ ports**, which are gaining market share and increasing their strategic role as primary entry and exit points for long-distance **EUROMED** routes.

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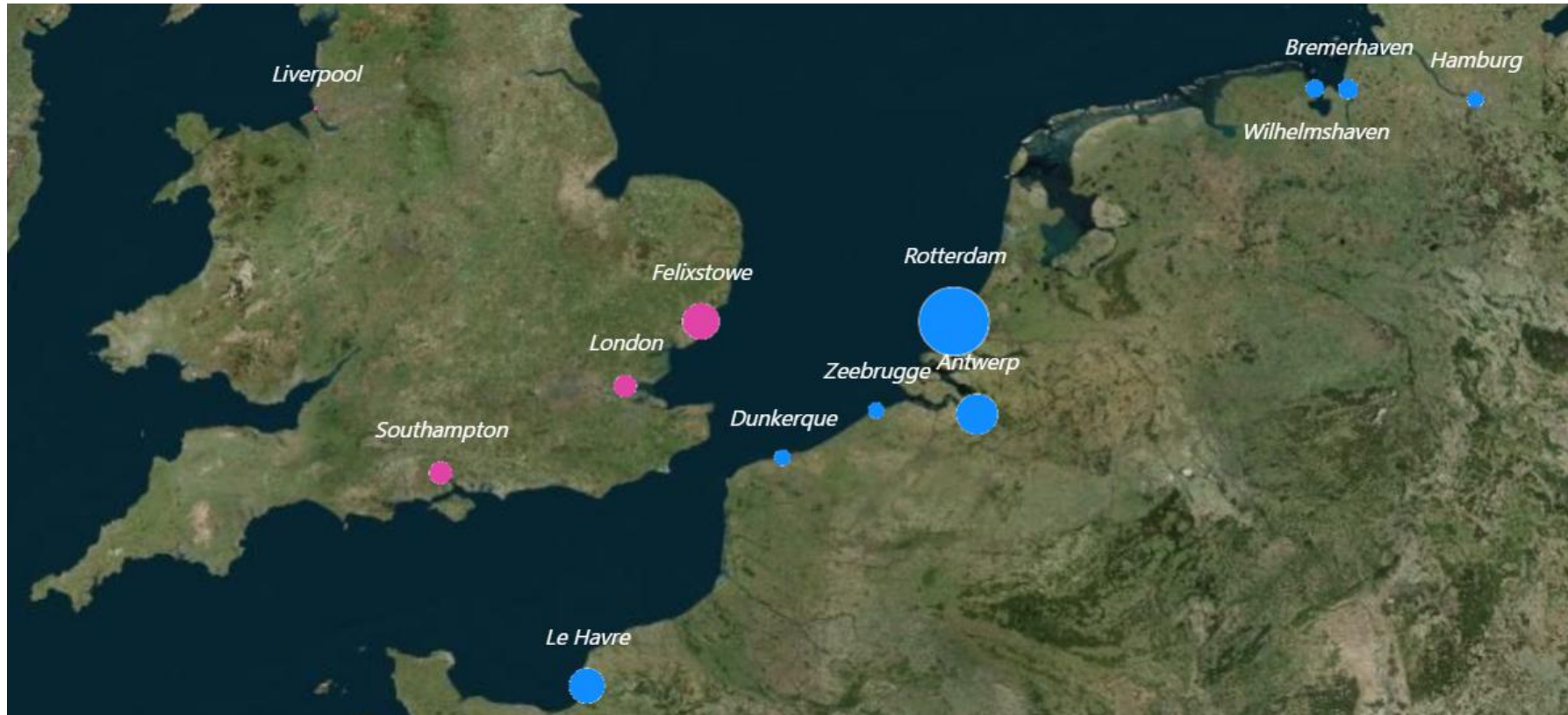
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Case Study I: United Kingdom



● EEA Ports of EEA countries.

● EEA+ Ports of neighbouring countries. All neighbouring ports are within 300 miles.

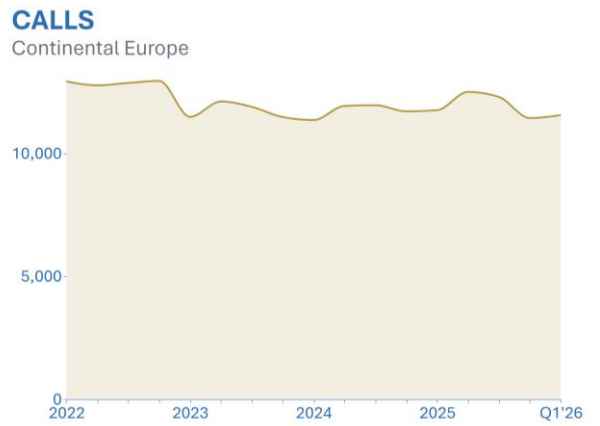
Case Study I: United Kingdom

Phase I – Detection / Tier 1 (high level scope). Evolution over time in the number of container vessel port-calls.

EEA
PORTS

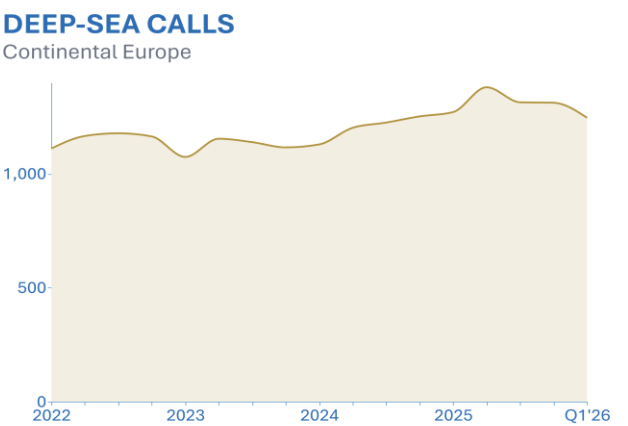
EUROMED

ALL CONTAINER SHIPPING ROUTES



EUROMED GATEWAY

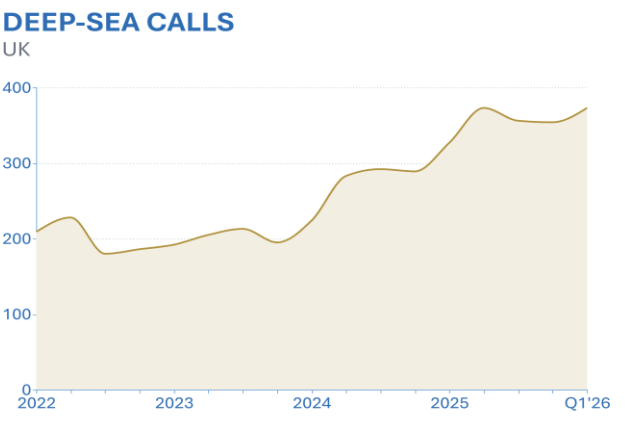
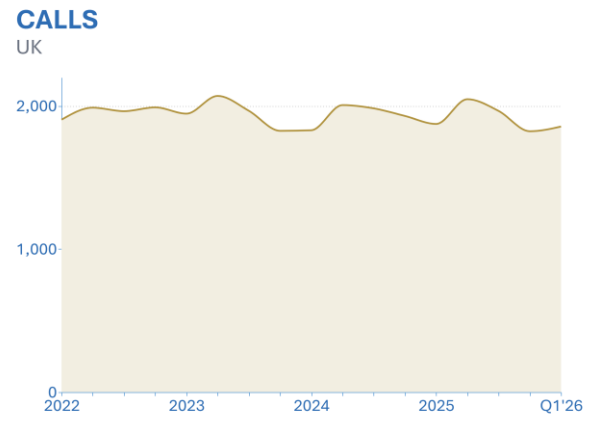
DEEP-SEA CONTAINER SHIPPING ROUTES



The analysis of the number of container ship calls at ports in the United Kingdom and at ports in Northern European EU countries — considering the full range of container shipping routes — reveals no significant changes since 2022.

However, when the focus is narrowed to calls on transoceanic (deep-sea) container shipping routes, UK ports have recorded sustained growth from late 2023 through to the first quarter of 2026.

EEA+
PORTS



The fact that this increase in deep-sea calls at UK ports has not been accompanied by a corresponding decline at Northern European ports suggests a growing number of vessels bound for the region, and the United Kingdom capturing a bigger share.

This analysis underscores the importance of concentrating on entry and exit routes to and from the EUROMED region, namely transoceanic (deep-sea) container shipping routes.

Case Study I: United Kingdom

Phase I – Detection / Tier 1 (high level scope). Evolution over time of the TEU_Mile indicator.

EEA
PORTS

EUROMED

ALL CONTAINER SHIPPING ROUTES

KTEU MILES

Continental Europe



EUROMED GATEWAY

DEEP-SEA CONTAINER SHIPPING ROUTES

DEEP-SEA KTEU MILES

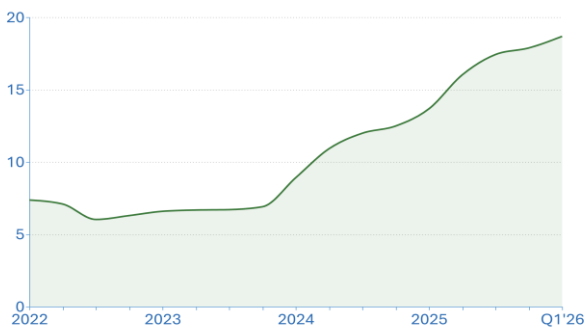
Continental Europe



EEA+
PORTS

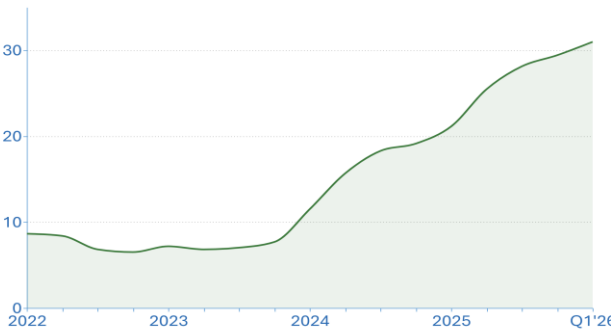
KTEU MILES

UK



DEEP-SEA KTEU MILES

UK



The evolution of the kTEU mile indicator clearly shows the impact of the Red Sea crisis on maritime traffic from late 2023 onward.

This event leads to a rapid increase in this indicator, both in total traffic and in transoceanic routes.

In the United Kingdom, sustained growth is observed in both cases, with no sign of slowdown.

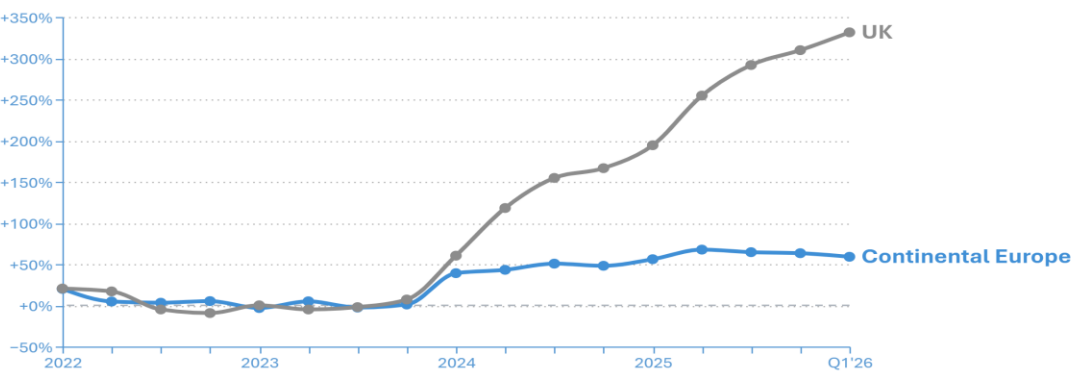
In ports of Northern European EU countries, growth in the TEU-mile parameter for transoceanic routes is slower and comes to a halt during the first quarter of 2026.

Case Study I: United Kingdom

Phase I – Detection / Tier 1 (high level scope) Evolution over time of the TEU_Mile and share_TEU_Mile indicators.

DEEP-SEA kTEU MILES GROWTH

kTEU·miles · % vs 2023 average



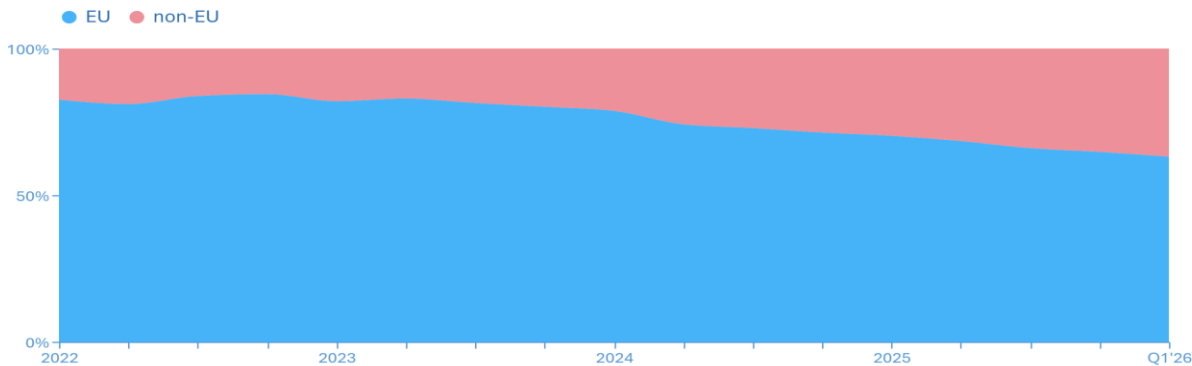
EUROMED GATEWAY

The top chart illustrates the growth of the TEU-mile indicator for transoceanic routes, expressed as a percentage increase relative to the first quarter of 2023. This visualization confirms two primary trends: first, the accelerated growth of the kTEU mile indicator within UK ports; and second, a distinct plateauing of growth for Northern European EU ports.

The lower chart shows how the TEU-mile share of UK ports has increased progressively since 2023 relative to the TEU-mile share of Northern European ports.

DEEP-SEA TRANSPORT WORK SHARE

kTEU·miles

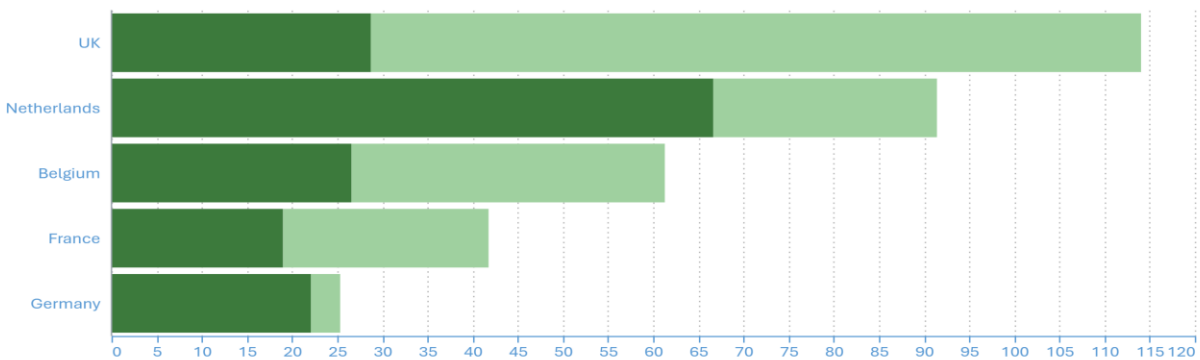


Case Study I: United Kingdom

Phase I – Detection / Tier 1 (high level scope) Evolution over time of the TEU_Mile and share_TEU_Mile indicators by country.

KTEU MILES

2023 + Δ 2025-26

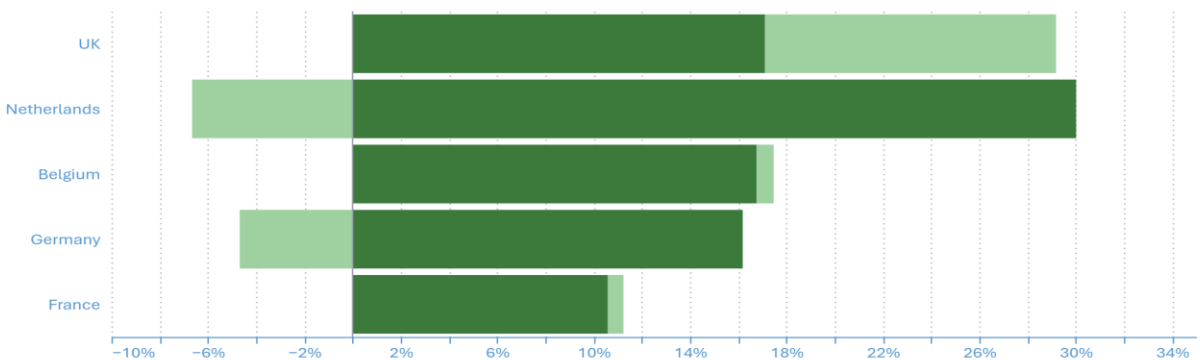


EUROMED GATEWAY

Compared to 2023, growth in the TEU-mile indicator is observed both in the United Kingdom and in the main surrounding EU countries. However, this growth is much stronger in the United Kingdom than in the other countries, making it the only country where the TEU mile share increases significantly. In Belgium and France, it barely rises, while in the Netherlands and Germany it declines.

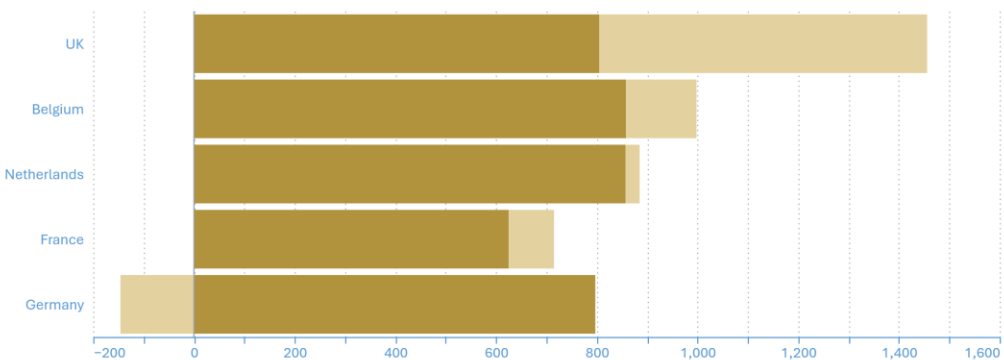
KTEU MILES SHARE

2023 + Δ 2025-26



CALLS

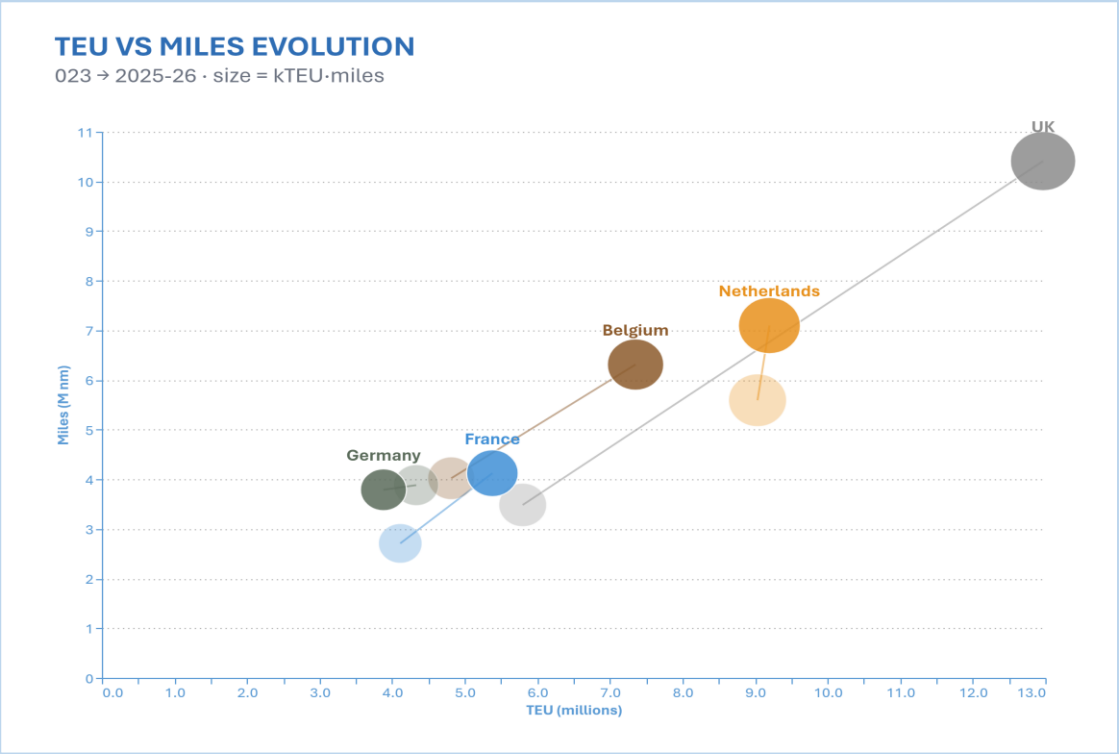
2023 + Δ 2025-26



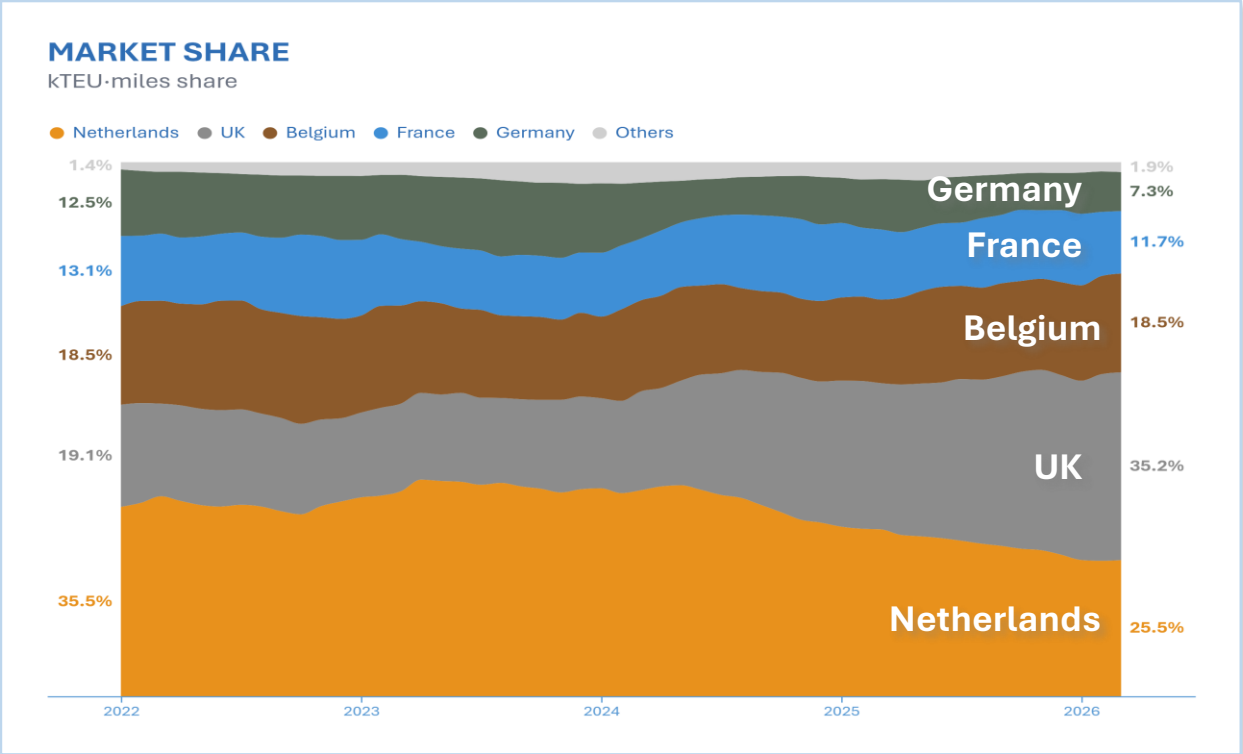
Case Study I: United Kingdom

Phase I – Detection / Tier 1 (high level scope) Evolution over time of the TEU_Mile and share_TEU_Mile indicators by country.

EUROMED GATEWAY



The light circles show the status of each country in 2023. The dark circles show the status in oct.2023-Q12026. **The UK surpasses the northern European countries in both capacity and nautical miles sailed from its ports.**



Time evolution of KTEU-mile share. The area chart evidences a direct market transfer: **the UK's ~19 percentage point gain in TEU-mile share is almost symmetrical to the combined loss of the Netherlands and Germany.**

Case Study I: United Kingdom

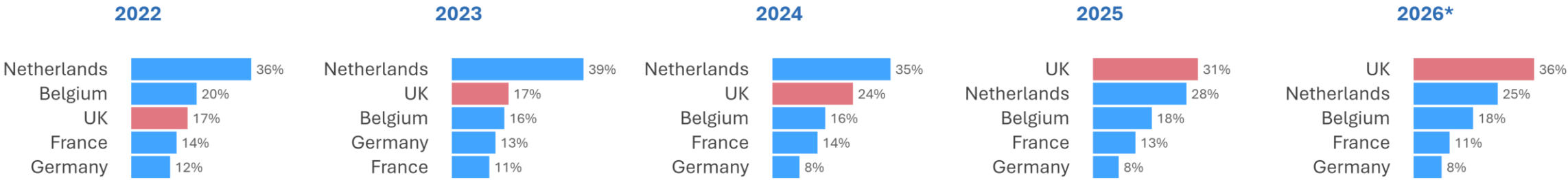
Phase I – Detection / Tier 1 (high level scope) Evolution over time of the TEU_Mile and share_TEU_Mile indicators by country.

EUROMED GATEWAY

DEEP-SEA TRAFFIC SHARE BY COUNTRY

kTEU-miles

■ EEA ■ EEA+



The United Kingdom’s share of deep-sea transport work rises significantly, from 17% in 2022 to 31% in 2025 and 36% in 2026. Over the same period, the Netherlands loses its leading position, falling from 36% to 25%. Overall, the figures point to a clear redistribution of gateway activity towards UK ports, while Belgium remains broadly stable and France declines moderately.

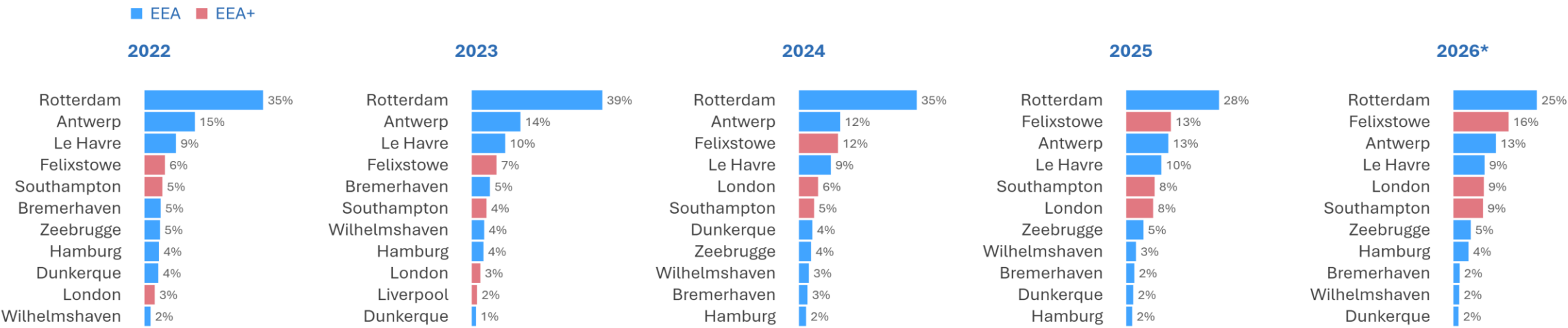
Case Study I: United Kingdom

Phase I – Detection / Tier 1 (high level scope) Evolution over time of the TEU_Mile and share_TEU_Mile indicators by port.

EUROMED GATEWAY

DEEP-SEA TRAFFIC SHARE BY PORT

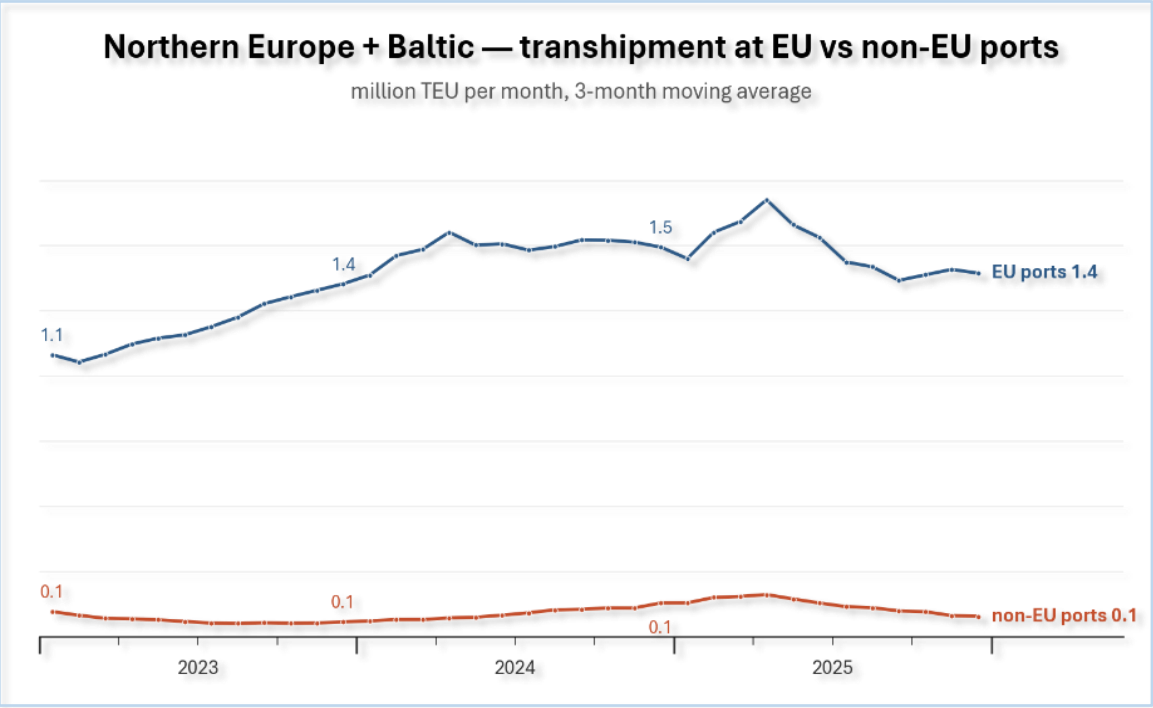
kTEU·miles



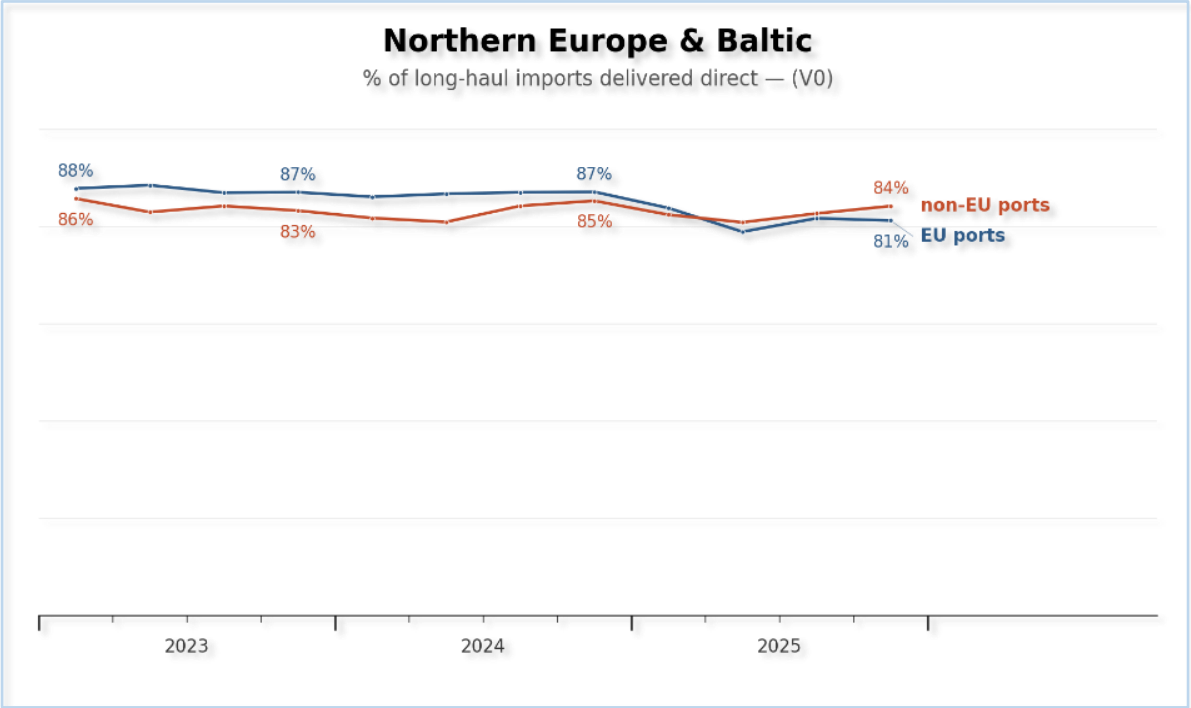
The TEU mile share of British ports has grown from 17% in 2022 to 36% in 2026. As a result, the UK has become the leading port area in Northern Europe in terms of TEU mile share, with 3 out of the 6 top ports in 2026.

Case Study I: United Kingdom

Phase I – Detection / Tier 2. Evolution over time of Transshipment and Direct Connectivity using the *container tracking dataset**



Despite the sustained rise in UK deep-sea calls identified previously, container-tracking data indicate that transshipment activity remains broadly stable around 13-14% of total UK throughput.



The direct connectivity ratio of EU ports have been reduced from 88% to 81% while non-EU ports remain stable. This reduction of direct connectivity ratio is compatible with EU-ETS evasive strategies of service transformation or fragmentation so must be monitored.

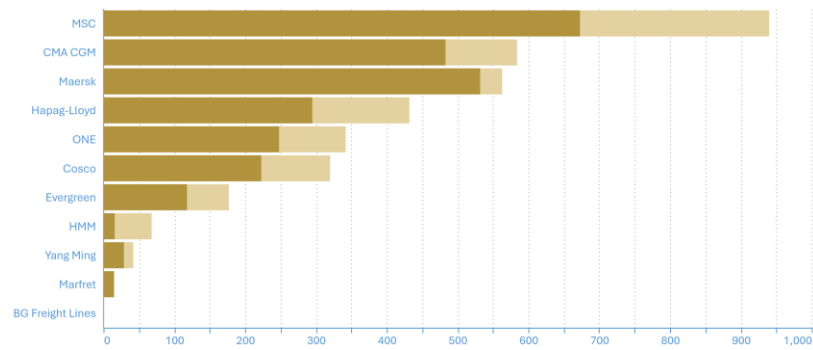
Overall, **the growth in UK deep-sea calls and TEU mile share is beginning to show in cargo flows.** The observed route reorganisation may be consistent with EU ETS avoidance strategies, and the tracking data suggest a recent erosion of direct flows through EU ports to be monitored.

Case Study I: United Kingdom

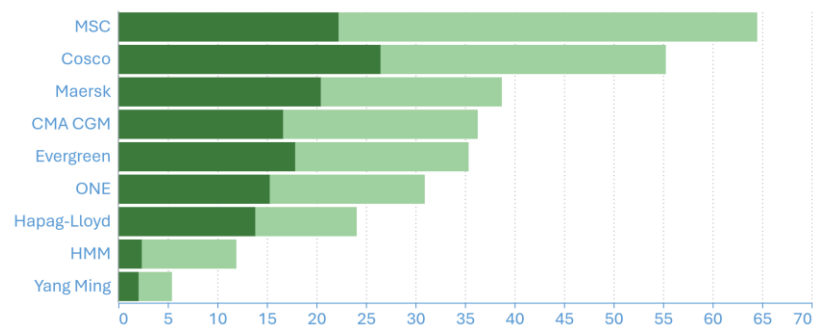
Phase I – Detection / Tier 3 (service/company level). Evolution over time of port-call and TEU_Miles by operators.

EUROMED GATEWAY

CALLS BY OPERATOR
2023 + Δ 2025-26

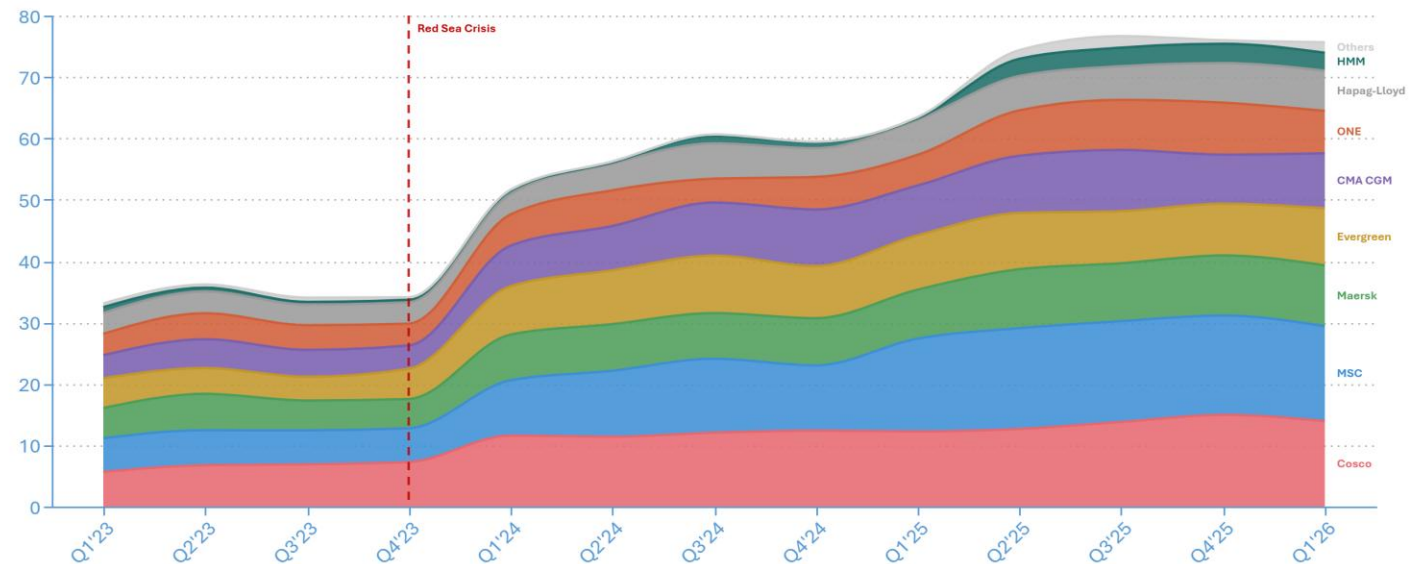


KTEU-MILES BY OPERATOR
2023 + Δ 2025-26



Compared to 2023, all shipping companies, have grown significantly in British ports, both in the number of calls on long-haul routes and in kTEU miles. The significant presence and growth of MSC is noteworthy, as is the rapid growth of Maersk since the last half of 2025.

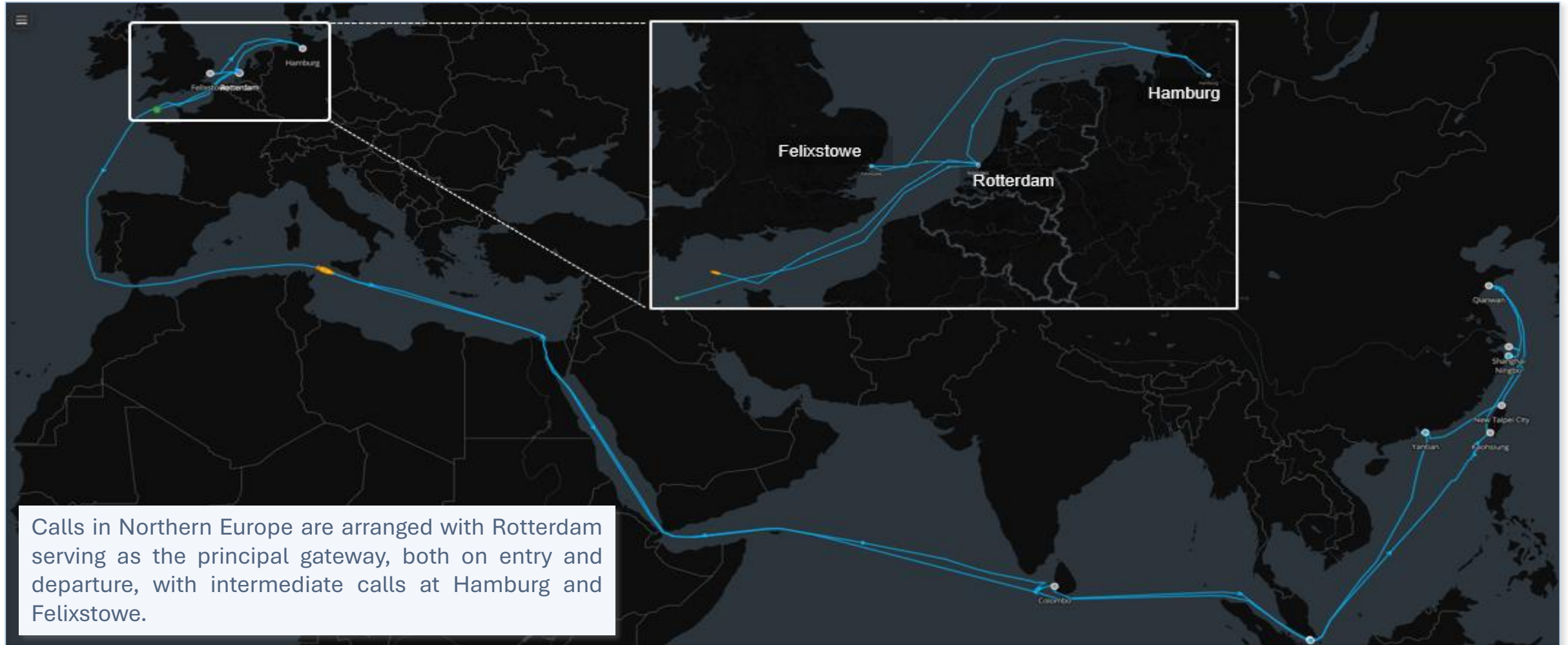
KTEU-MILES BY OPERATOR
Top operators



Case Study I: United Kingdom

Phase I – Detection / Tier 3 (service/company level). Maritime service transformation.

Example of a route configuration. Asia-North Europe 2023



Case Study I: United Kingdom

Phase I – Detection / Tier 3 (service/company level). Maritime service transformation.

Example of a route configuration. Asia-North Europe 2025



Case Study I: United Kingdom

Phase I – Detection / Conclusions

Tier	Detection	Findings
Tier 1	Port level Activity	Since late 2023, UK ports have recorded sustained growth in deep-sea transport work , while calls across all container routes show no significant change. The UK's share of deep-sea kTEU-miles in Northern Europe rose from 17% in 2023 to 36% in Q1 2026, a gain almost symmetrical to the combined loss of the Netherlands and Germany. Growth at EU Northern ports plateaus towards the end of the period, whereas UK growth shows no sign of slowdown: British ports are taking an increasing role as first and last port of call on deep-sea services into and out of the region.
Tier 2	Network Level structural metrics	The gain in gateway prominence is not matched at cargo level: relay activity at UK ports remains flat at 13–14% of throughput, with no comparable rise in import/export volumes. The additional deep-sea connectivity is therefore not being converted into transshipment or local trade — services are inserting or repositioning a UK call without breaking their continuity. Direct connectivity remains high on both blocks and the gap has narrowed slightly , with non-EU gateways improving while European ones ease; the movement is too small to support any conclusion at this stage and remains under monitoring.
Tier 3	Voyage-Specific behavioural metrics	Growth at British ports is broad-based rather than carrier-specific: compared with 2023, all major operators increased both deep-sea calls and transport work at UK ports, with MSC standing out for scale and Maersk growing rapidly from the second half of 2025. The pattern is the insertion or repositioning of a UK call within an otherwise unchanged rotation: on an Asia–North Europe service, Rotterdam served as gateway on both entry and departure in 2023, while by 2026 the same ports are still called but the gateway is more often an UK port.

Case Study I: United Kingdom

Phase II – Attribution / Conclusions

Level	Attribution	Finding
1	Has there been a significant improvement in the UK economic activity?	UK GDP and trade volumes have not grown significantly since 2022. The connectivity increase is not demand-driven but reflects a supply-side shift in how container traffic reaches UK destinations.
	Has there been a reduction in operating costs at UK ports?	In the current inflationary environment, there is no evidence that UK ports have reduced their operating costs relative to continental competitors like Rotterdam or Antwerp. Cost arbitrage at port level is not the driver.
	Do UK ports have better infrastructure or greater capacity?	UK ports (Felixstowe, London Gateway, Southampton) are actively investing in dredging and crane upgrades. This signals that ports were previously NOT adapted to receive ULCV vessels directly. Likewise, during the 2021–2024 period, the Port of London Gateway developed a new berth that increased its operational capacity from 2.4 to 3.5 million TEUs per year. This capacity will be further expanded with the development of two additional berths, enabling the port to reach 5.25 million TEUs per year by the end of 2029, which suggests that this port did not previously have the necessary capacity to become a key hub for the arrival and departure of containers in Northern Europe.
	Are there structural congestion problems at Northern European ports?	Structural congestion exists at major continental hubs (Rotterdam, Antwerp, Hamburg), but these are primarily caused by temporary factors (labour strikes, weather events, pandemic aftermath). This explains some short-term diversion but not the sustained 17% → 36% market share shift observed.

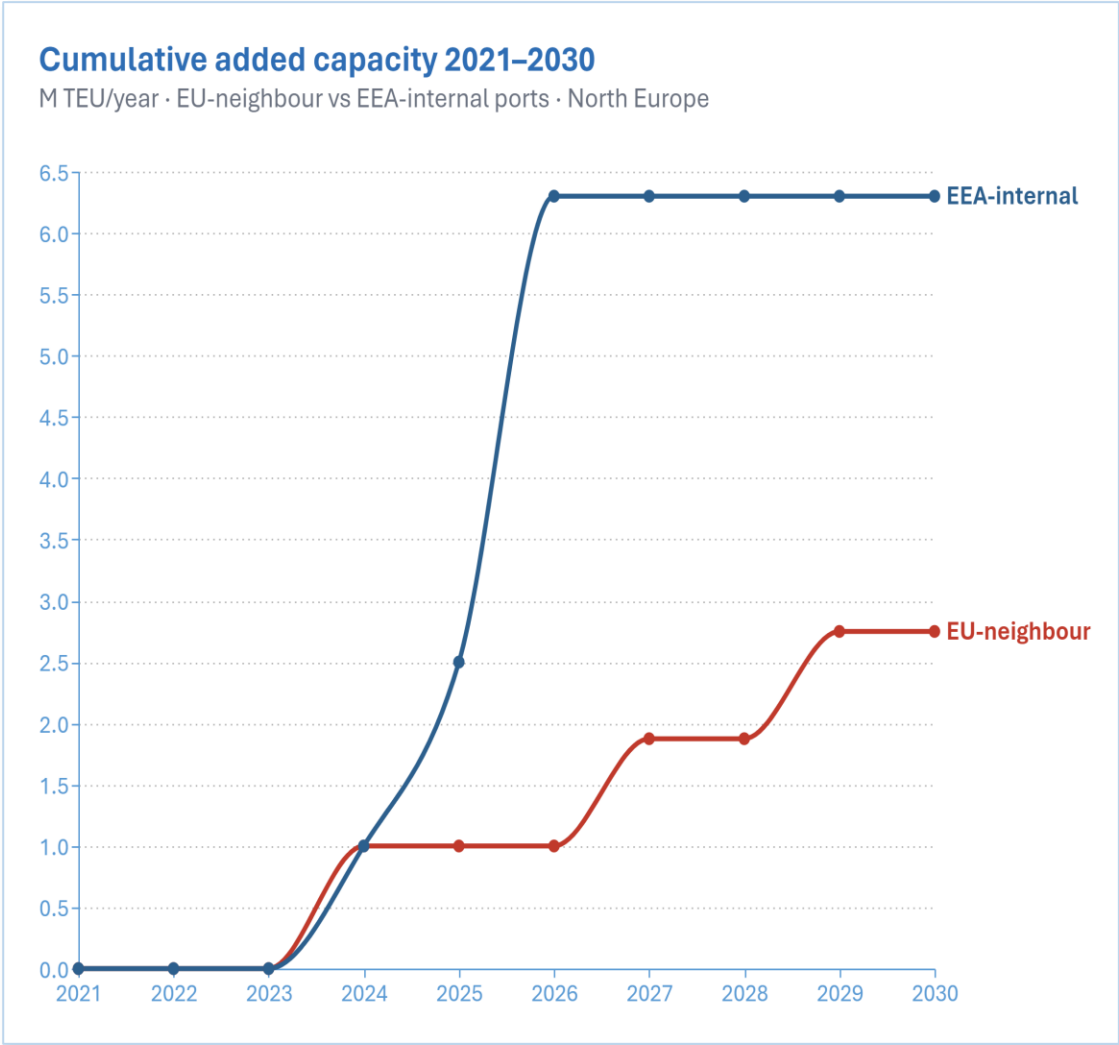
Case Study I: United Kingdom

Phase II – Attribution / Conclusions

Level	Attribution	Finding
1	Could the expiration of the CBER have given any advantage to UK ports?	The EU's Consortia Block Exemption Regulation expired in April 2024, coinciding with UK's equivalent competition exemption ending.
	Could the closure of the Suez Canal have given any advantage to UK ports?	The increase in distance implied by routing via the Cape of Good Hope affects UK ports equally compared to North European ports.
	Is there any other factor that could increase the profitability of a transoceanic service if it makes an intermediate call at UK ports?	A ULCV sailing from Asia to UK directly (vs. transshipment via Rotterdam/Antwerp) can save approximately €1 million per voyage in EU ETS costs. UK ports remain outside ETS scope, creating a structural incentive for carriers to bypass EEA hubs when serving UK-destined cargo. This is the primary hypothesis for the observed traffic shift.
2	Quantitative verification	European ports see their direct connectivity ratio dip slightly — unlike British ports.

Case Study I: United Kingdom

Investments in container terminals in UK Ports vs continental Europe



Ctry.	Port	Terminal	Inv. €M	Expected Date	Throughput M TEU per year
UK	London Gateway	Berth 4	350	2024	1,0
UK	London Gateway	Berths 5+6	1.150	2027–29	1,8
Total EEA+			1.500		2,8
FR	Le Havre	Port 2000 berths 11–12	154	2024	1,0
PL	Gdansk	Baltic Hub T3	470	2025	1,5
NL	Rotterdam	APMT MVII	800	2027	2,0
NL	Rotterdam	RWG MVII	500	2026	1,8
Total EEA			1.924		6,3

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Case Study II: Eastern Mediterranean



● EEA Ports of EEA countries.

● EEA+ Ports of neighbouring countries.
All neighbouring ports are within 300 miles.

Case Study II: Eastern Mediterranean

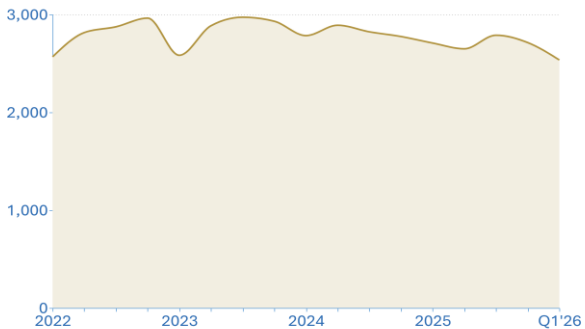
Phase I – Detection / Tier 1 (High level analysis). Evolution over time in the number of container vessel port-calls

EUROMED

ALL CONTAINER SHIPPING ROUTES

CALLS

Eastern Mediterranean EEA

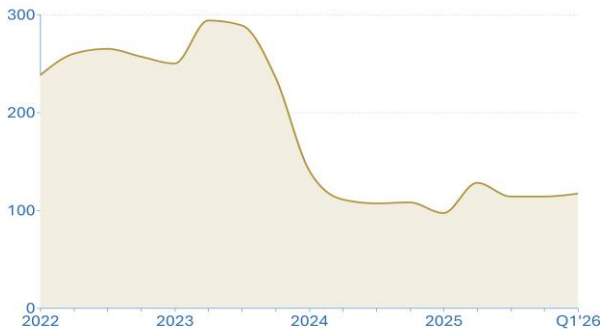


EUROMED GATEWAY

DEEP-SEA CONTAINER SHIPPING ROUTES

DEEP-SEA CALLS

Eastern Mediterranean EEA



When looking at the evolution of port calls across all container shipping routes, non-EU ports do not display a clear trend. By contrast, EU ports have recorded a gradual decline since the end of 2023.

The picture is more pronounced for *deep-sea* routes. In this segment, port calls fell markedly in the last quarter of 2023 in both non-EU and EU ports, with the decline being sharper and more pronounced in EU ports.

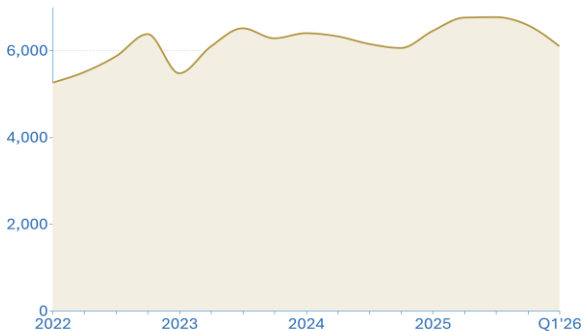
Since then, however, *deep-sea* port calls at non-EU ports have followed a gradual recovery path. No comparable rebound is observed in EU ports, where the series has remained broadly flat.

EEA PORTS

EEA+ PORTS

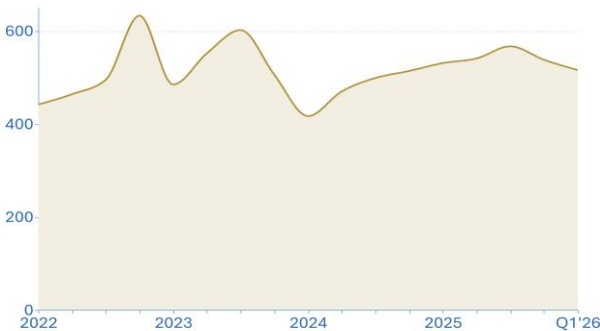
CALLS

Eastern Mediterranean EEA+



DEEP-SEA CALLS

Eastern Mediterranean EEA+



Case Study II: Eastern Mediterranean

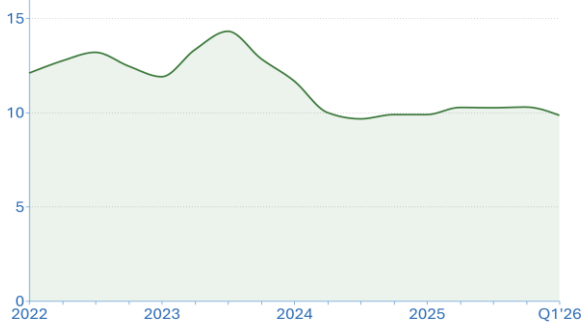
Phase I – Detection / Tier 1 (High level analysis). Evolution over time of the TEU_Mile indicator

EUROMED

ALL CONTAINER SHIPPING ROUTES

kTEU MILES

Eastern Mediterranean EEA

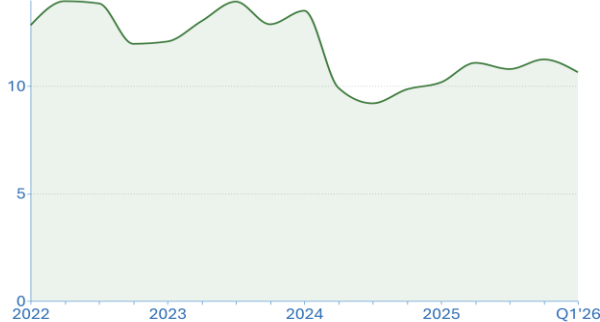


EUROMED GATEWAY

DEEP-SEA CONTAINER SHIPPING ROUTES

DEEP-SEA kTEU MILES

Eastern Mediterranean EEA



When considering all container shipping routes, transport work measured in kTEU miles at EEA ports in the Eastern Mediterranean declines from 2023 onwards and stabilises at a lower level. By contrast, EEA+ ports show a sustained increase, particularly from 2024.

The divergence is even more pronounced for deep-sea traffic. EEA ports experience a sharp reduction in deep-sea kTEU miles in 2024, followed by only a partial recovery, while EEA+ ports record strong growth and reach their highest levels in 2025.

EEA PORTS

EEA+ PORTS

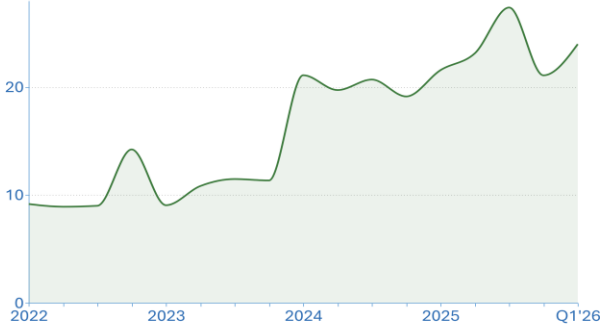
kTEU MILES

Eastern Mediterranean EEA+



DEEP-SEA kTEU MILES

Eastern Mediterranean EEA+



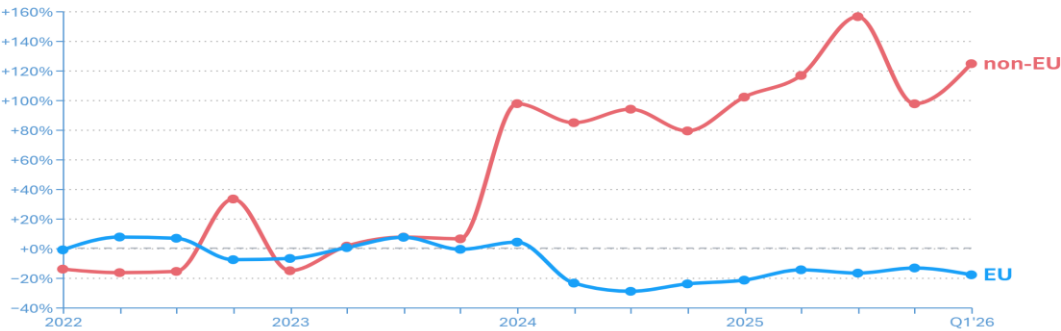
Overall, the figures indicate a relative shift in transport work towards neighbouring EEA+ ports. This pattern may be consistent with a redistribution of deep-sea gateway activity.

Case Study II: Eastern Mediterranean

Phase I – Detection / Tier 1 (high level scope) Evolution over time of the TEU_Mile and share_TEU_Mile indicators.

DEEP-SEA kTEU MILES GROWTH

kTEU·miles · % vs 2023 average

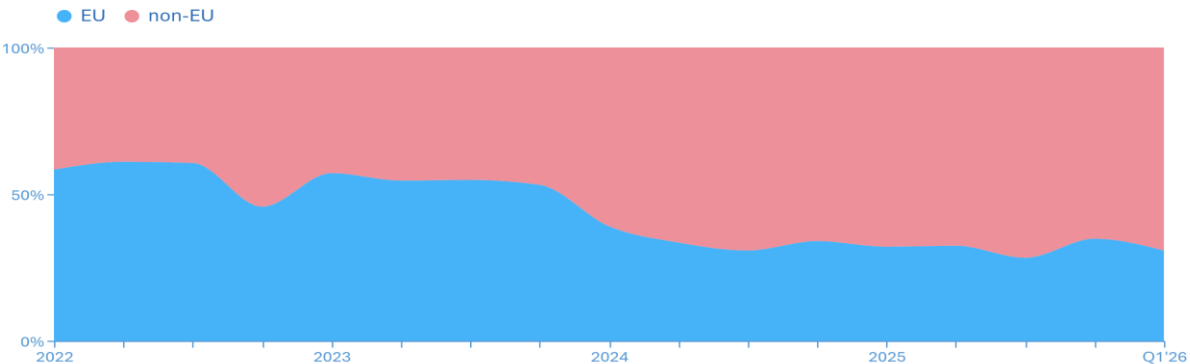


EUROMED GATEWAY

In the upper left-hand corner, the percentage growth of the TEU-mile indicator relative to the first quarter of 2023 is represented. In Egypt, there is rapid and sustained growth of the indicator, and in Turkey, this growth is more erratic but reaches a similar order of magnitude. Conversely, in Greece, a progressive and steady reduction in the value of the indicator is observed.

DEEP-SEA TRANSPORT WORK SHARE

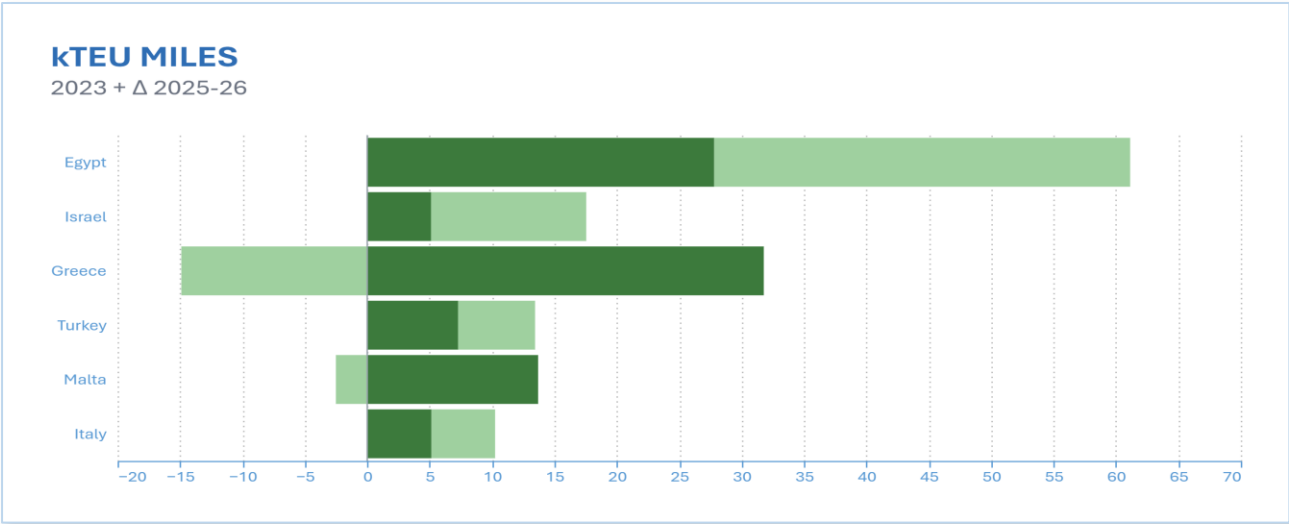
kTEU·miles



In the lower left-hand corner, the chart showing the evolution of the k TEU mile share illustrates this fact as a constant and sustained loss of the TEU-mile market share for EU countries in the Eastern Mediterranean relative to their neighbouring countries (primarily Egypt, Turkey, and Israel).

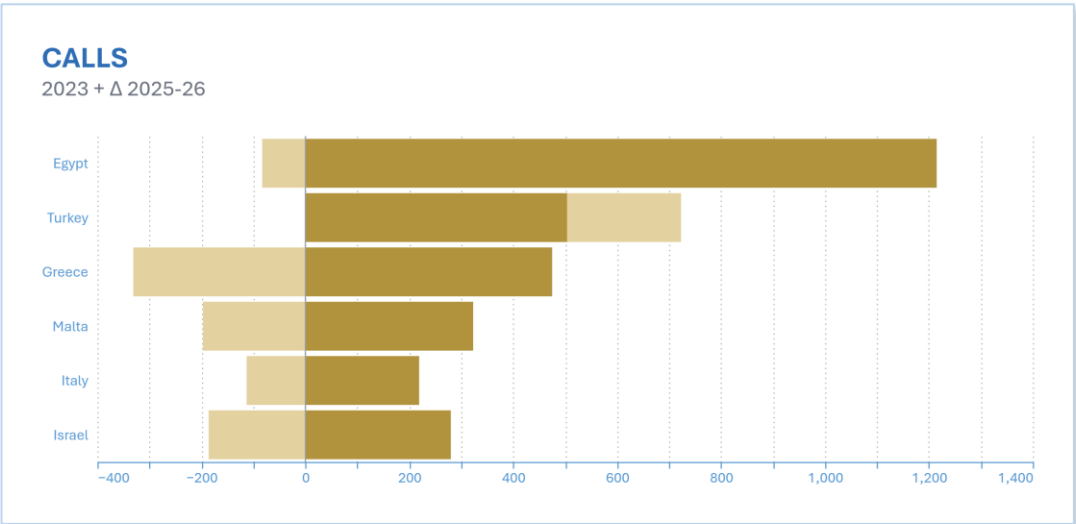
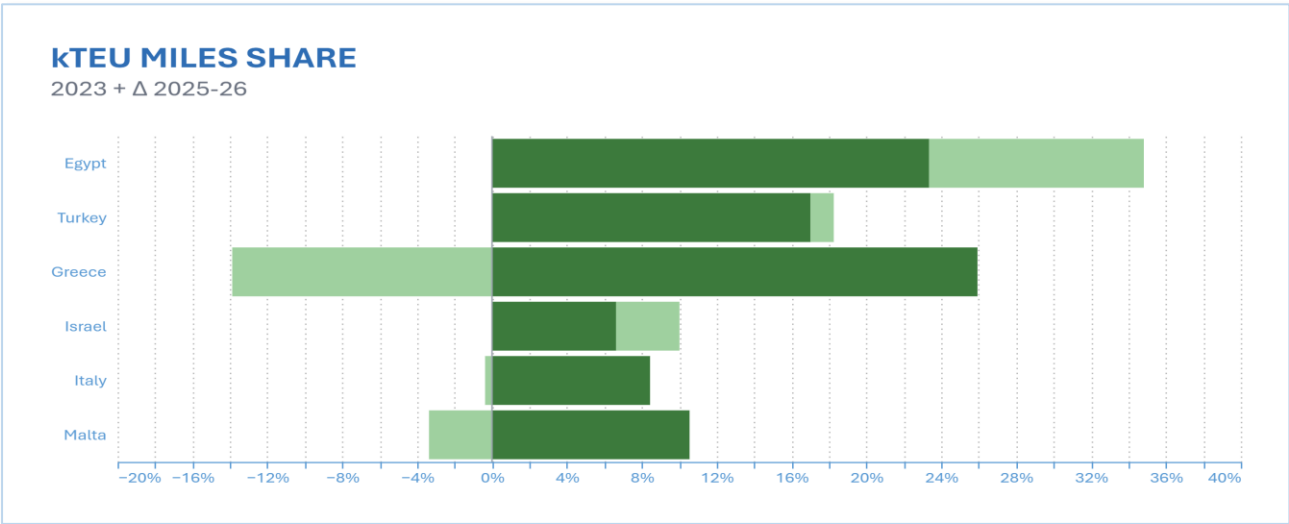
Case Study II: Eastern Mediterranean

Phase I – Detection / Tier 1 (high level scope). Evolution over time of the TEU_Mile and share_TEU_Mile indicators by country.



EUROMED GATEWAY

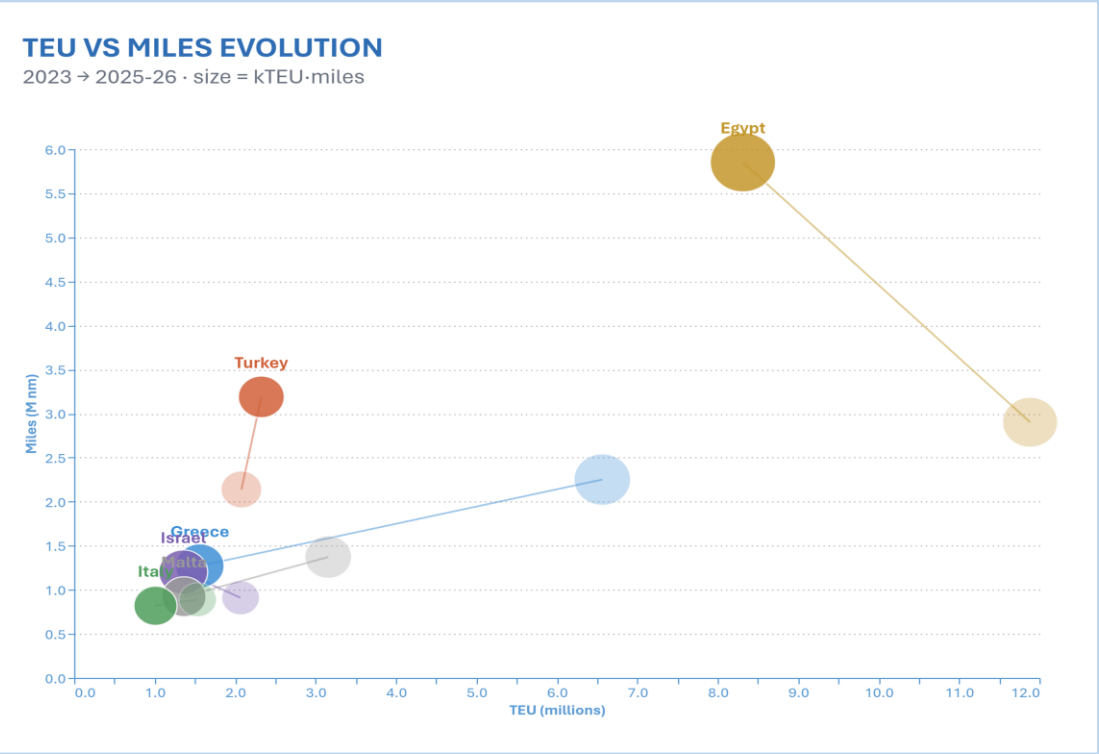
Between 2023 and 2025–26, Egypt emerges as the main growth driver in the Eastern Mediterranean, recording the largest increase in both kTEU miles and port calls. Israel and Turkey also strengthen their position, while Italy and Malta show more moderate gains. Greece increases in absolute transport work but loses regional share, indicating that growth elsewhere has been stronger. Overall, the figures suggest a progressive rebalancing of gateway activity towards Egypt and other non-EEA markets.



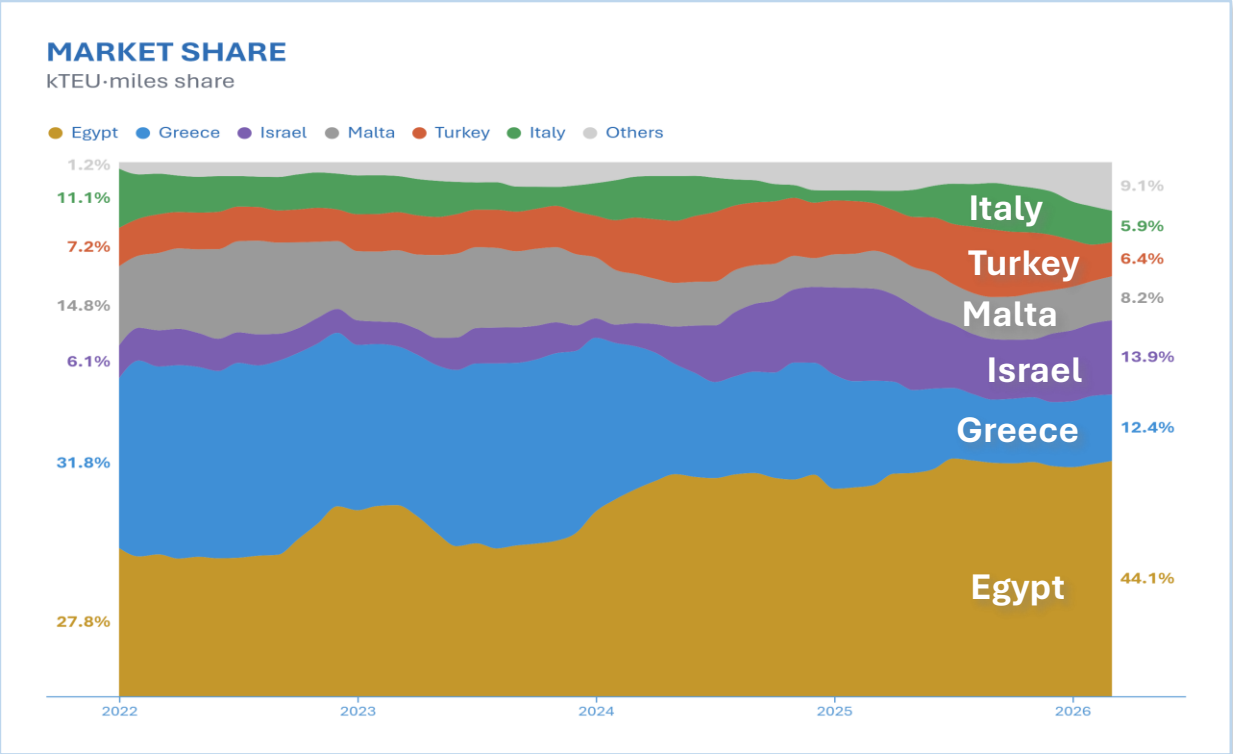
Case Study II: Eastern Mediterranean

Phase I – Detection / Tier 1 (high level scope). Evolution over time of the TEU_Mile and share_TEU_Mile indicators by country.

EUROMED GATEWAY



Greece is the country that loses the most connectivity, both in terms of capacity and distance (light circles, 2023 port status; dark circles, oct.2024-Q1 2026 port status).



After the Red Sea crisis, Greece has progressively lost TEU-mile share, while Turkey, Israel and Egypt have gained TEU-mile share, with Egypt showing both the largest TEU-mile share and the strongest growth trend.

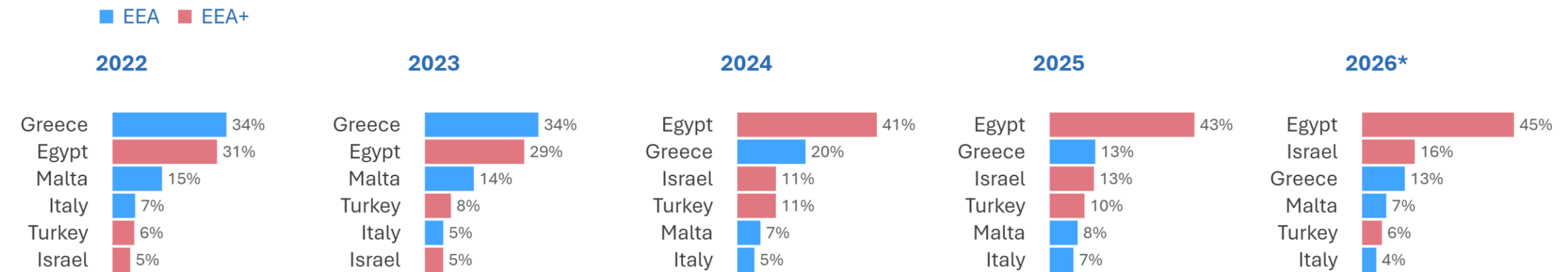
Case Study II: Eastern Mediterranean

Phase I – Detection / Tier 1 (high level scope) Evolution over time of the TEU_Mile and share_TEU_Mile indicators by country.

EUROMED GATEWAY

DEEP-SEA TRAFFIC SHARE BY COUNTRY

deep-sea kTEU·miles · East Med · ranking by year (2022–2025 + 2026*)



Egypt becomes the dominant Eastern Mediterranean gateway, increasing its share of deep-sea transport work from 29% in 2023 to 45% in 2026. Greece follows the opposite trend, falling from 34% to 13%. Israel also gains relevance, while Malta, Turkey and Italy remain secondary contributors.

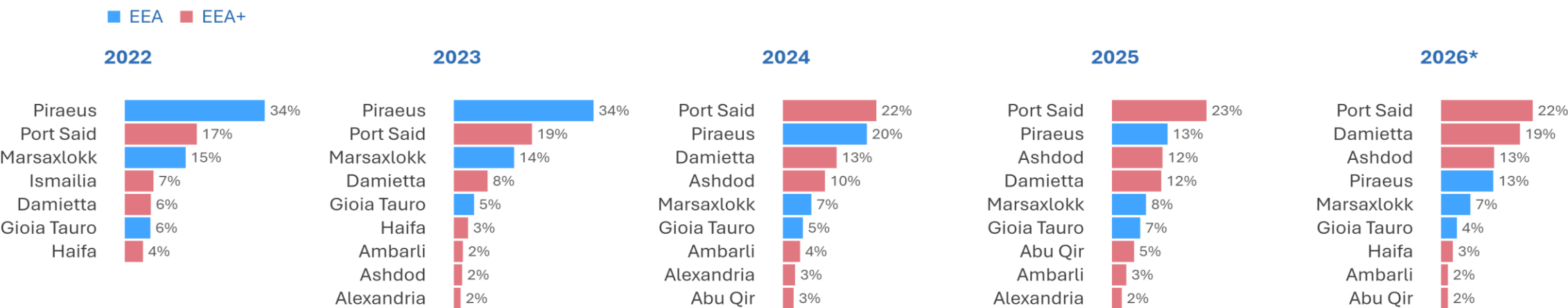
Case Study II: Eastern Mediterranean

Phase I – Detection / Tier 1 (high level scope) Evolution over time of the TEU_Mile and share_TEU_Mile indicators by port.

EUROMED GATEWAY

DEEP-SEA TRAFFIC SHARE BY PORT

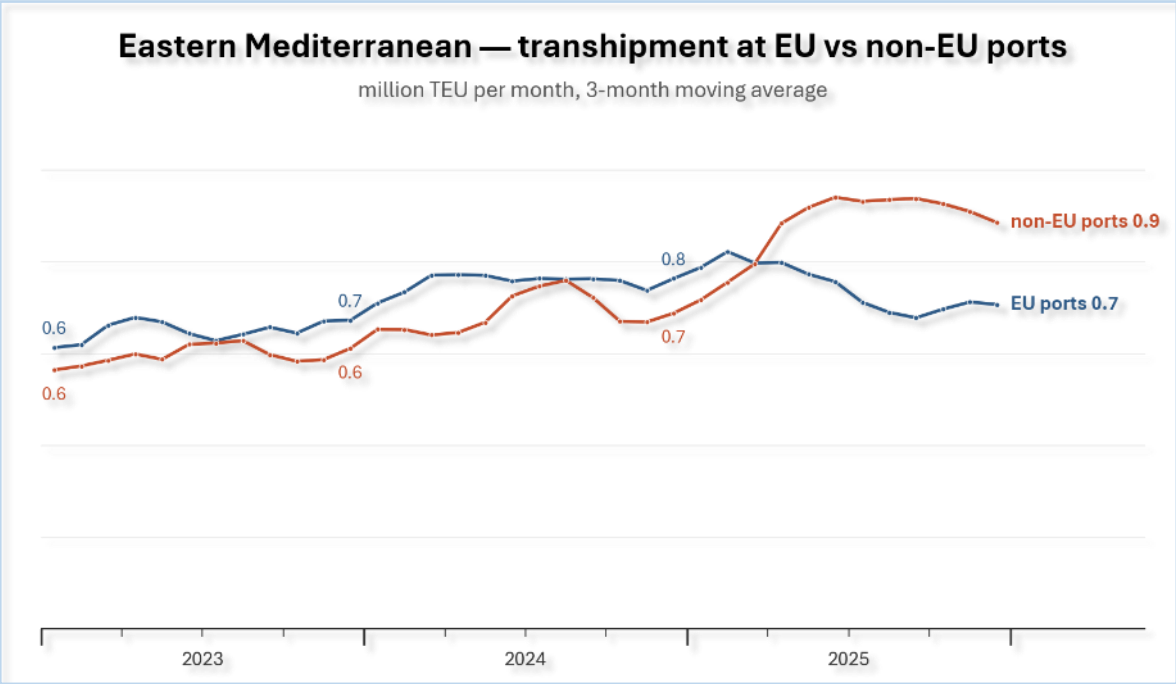
kTEU·miles



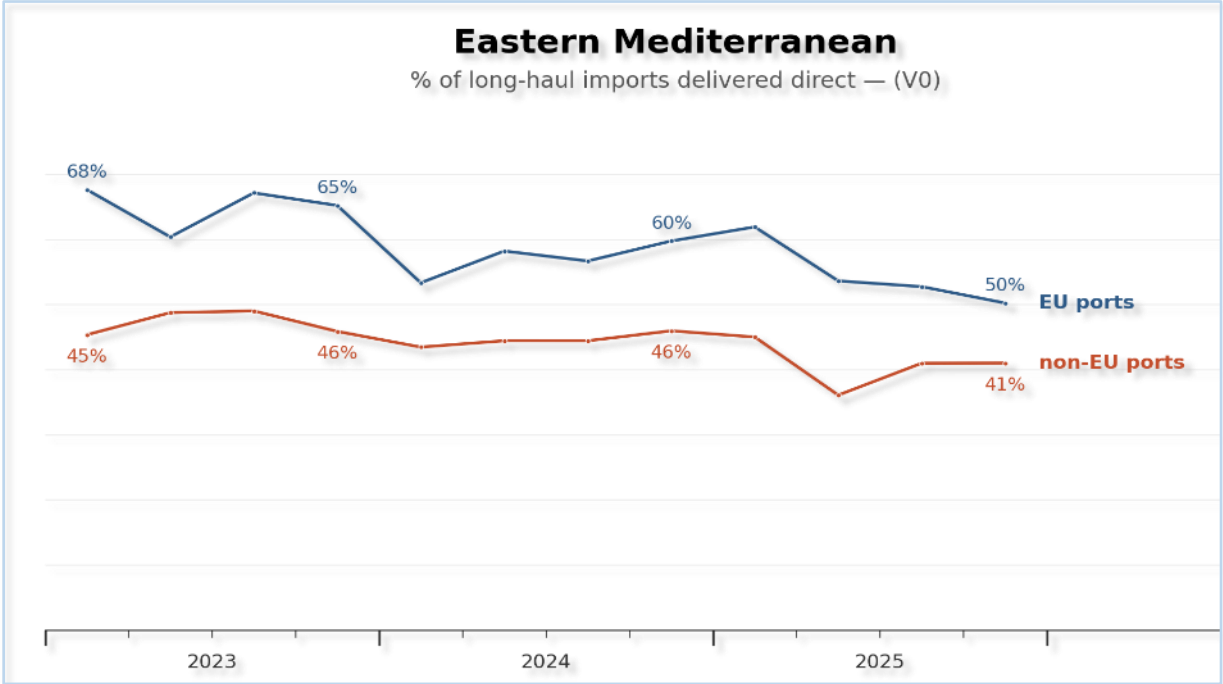
Port Said overtakes Piraeus as the leading Eastern Mediterranean gateway from 2024 onwards, maintaining a share above 20% through 2026. At the same time, Damietta and Ashdod gain relevance, while Piraeus falls sharply from 34% in 2022–23 to 13% in 2026. Overall, the figures show a clear redistribution of deep-sea transport work from EEA ports towards EEA+ gateways.

Case Study II: Eastern Mediterranean

Phase I – Detection / Tier 2. Evolution over time of Transshipment and Direct Connectivity using the *container tracking dataset**



Traffic reorganisation in the Eastern Mediterranean has shifted transshipment activity from EU to non-EU ports, **with non-EU hubs overtaking EU ports in March 2025**, shortly after the Gemini alliance began operations.



The **direct connectivity ratio to EU destinations has weakened** markedly: the share of long-haul import volume delivered direct **fell from ~68% to 50% over 2023–2025**. Non-EU ports eased more gently, from ~48% to 41%.

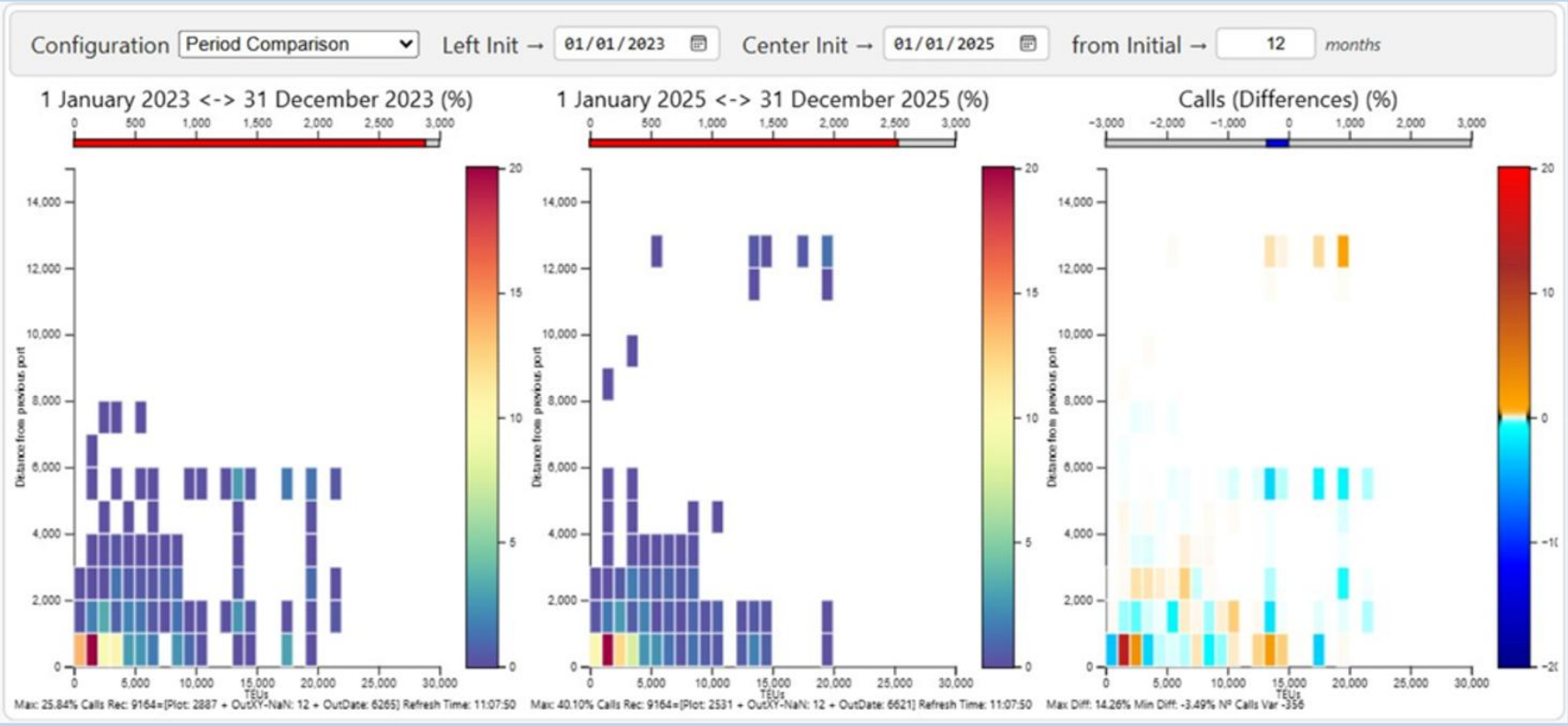
Overall, *the results show it's very likely that direct services to EU ports are being split*, relying on neighbouring non-EU ports transshipment.

* Source: EconDB

Case Study II: Eastern Mediterranean

Phase I – Detection / Tier 2 (high level scope)

EUROMED GATEWAY



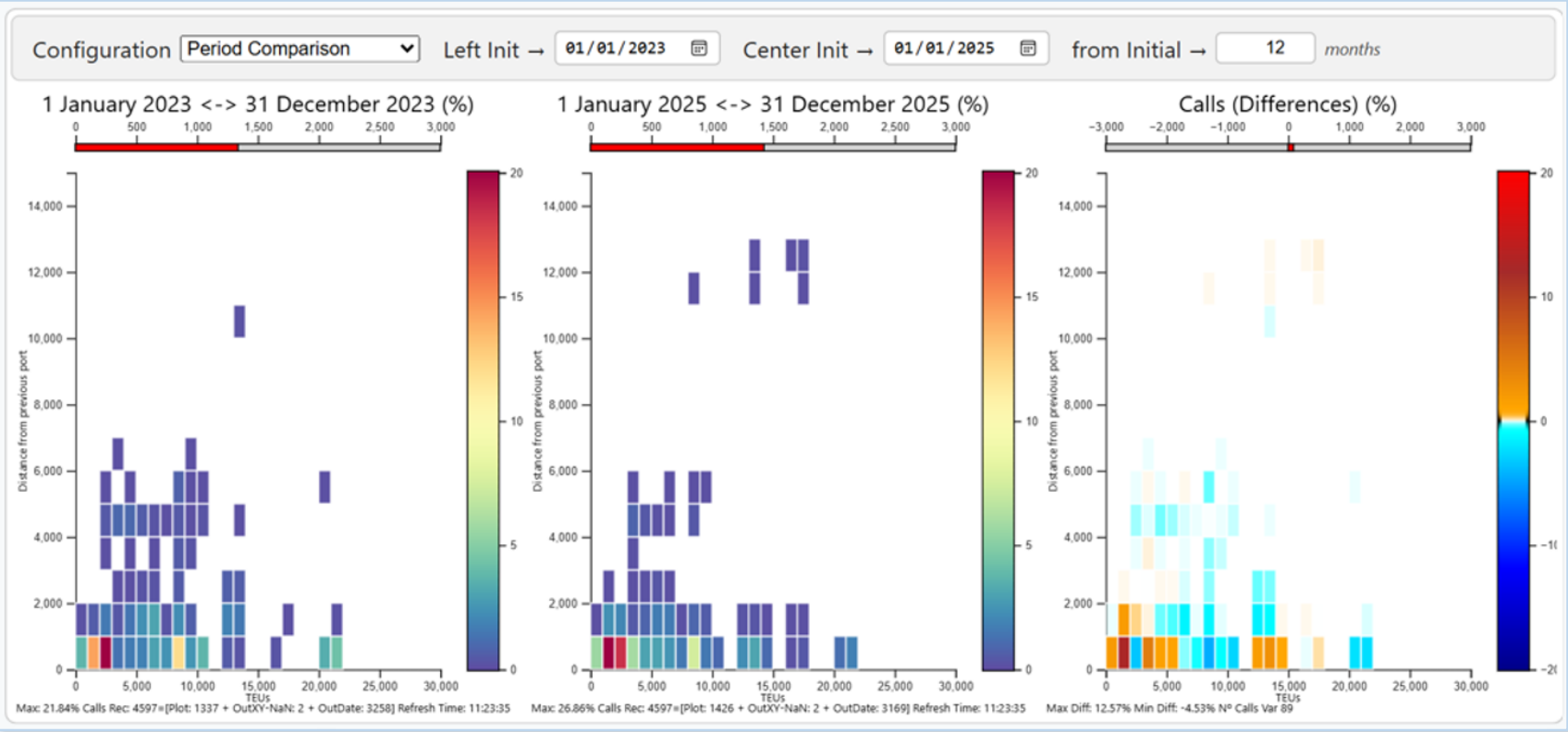
Evolution over time of route configurations at the Port of Piraeus. The X-axis represents vessel capacity, the Y-axis the distance travelled, the colour scale the frequency of each configuration, and the vertical bar the number of port calls.

In 2025, the share of port calls by vessels with capacities between 1,000 and 2,000 TEUs traveling less than 1,000 miles **increased by 14 percentage points** respect to 2023.

Case Study II: Eastern Mediterranean

Phase I – Detection / Tier 2 (high level scope)

EUROMED GATEWAY



Evolution over time of route configurations at the Port of Gioia Tauro. The X-axis represents vessel capacity, the Y-axis the distance travelled, the colour scale the frequency of each configuration, and the vertical bar the number of port calls.

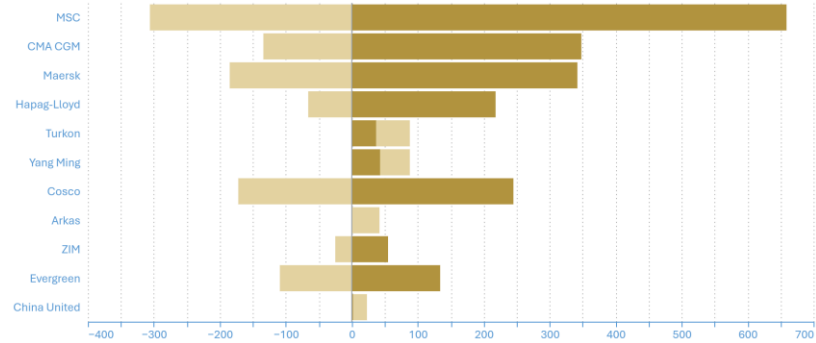
In 2025, the share of port calls by vessels with capacities between 1,000 and 2,000 TEUs traveling less than 1,000 miles increased by 12 percentage points respect to 2023.

Case Study II: Eastern Mediterranean

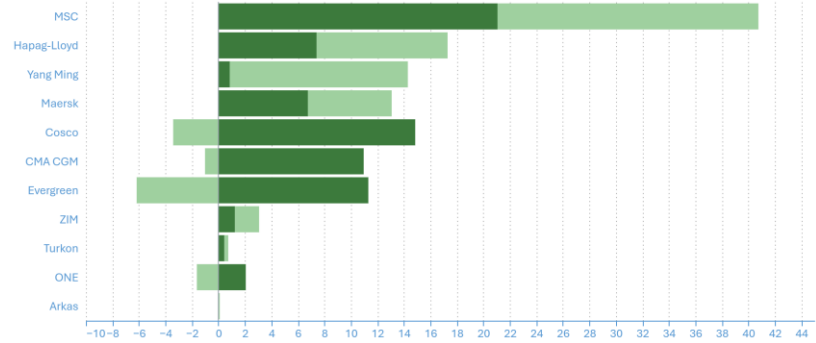
Phase I – Detection / Tier 3 (service/company level)

EUROMED GATEWAY

CALLS BY OPERATOR
2023 + Δ 2025-26

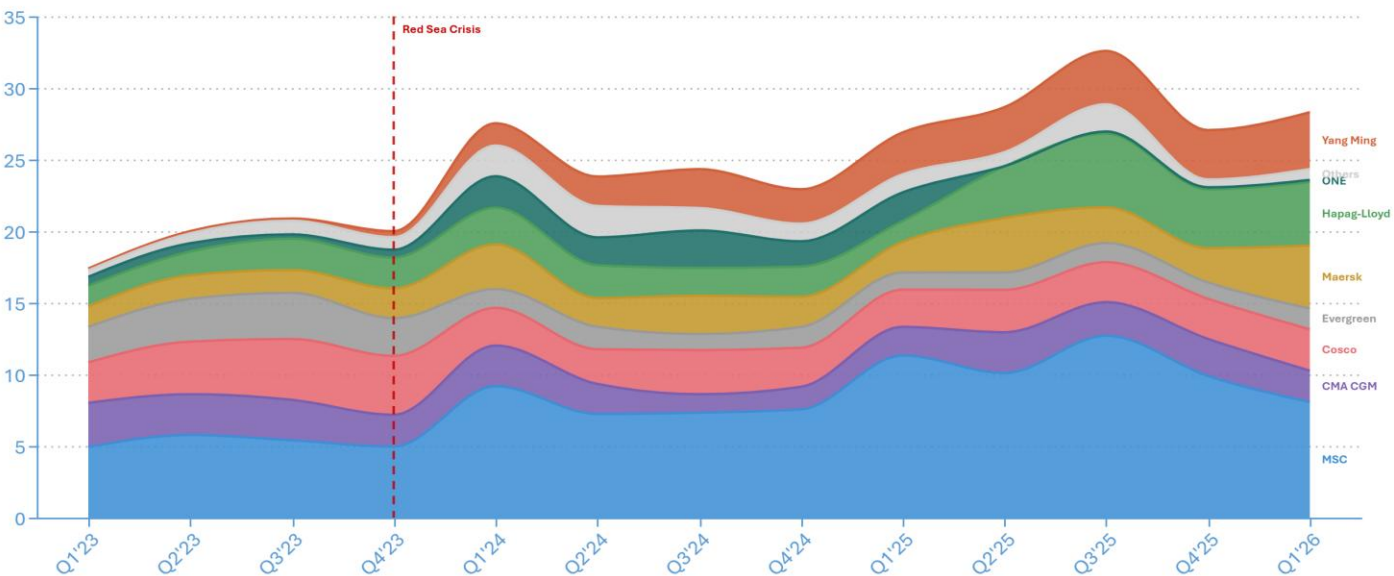


kTEU-MILES BY OPERATOR
2023 + Δ 2025-26



Compared with 2023, deep-sea activity has increased across most operators, with MSC clearly leading growth in both calls and kTEU-miles. Hapag-Lloyd, Yang Ming and Maersk also record significant gains, while CMA CGM and Evergreen strengthen their contribution.

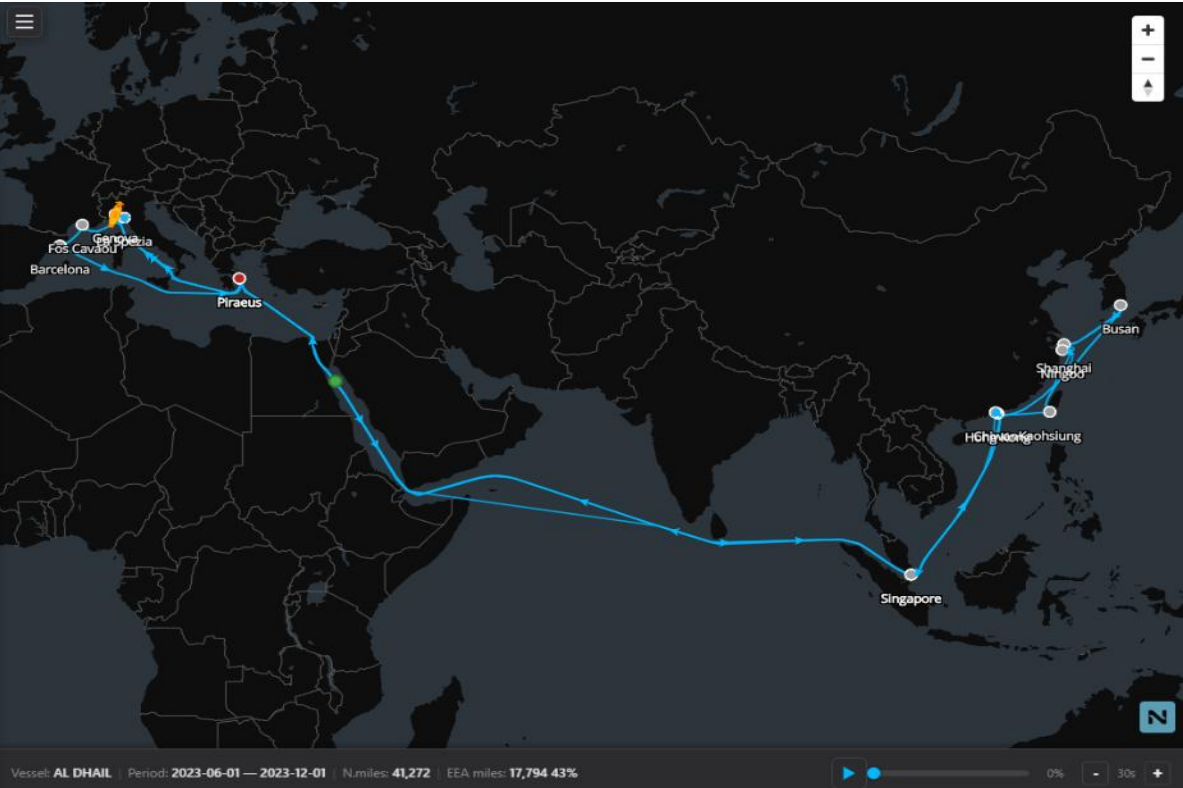
kTEU-MILES BY OPERATOR
Top operators



Case Study II: Eastern Mediterranean

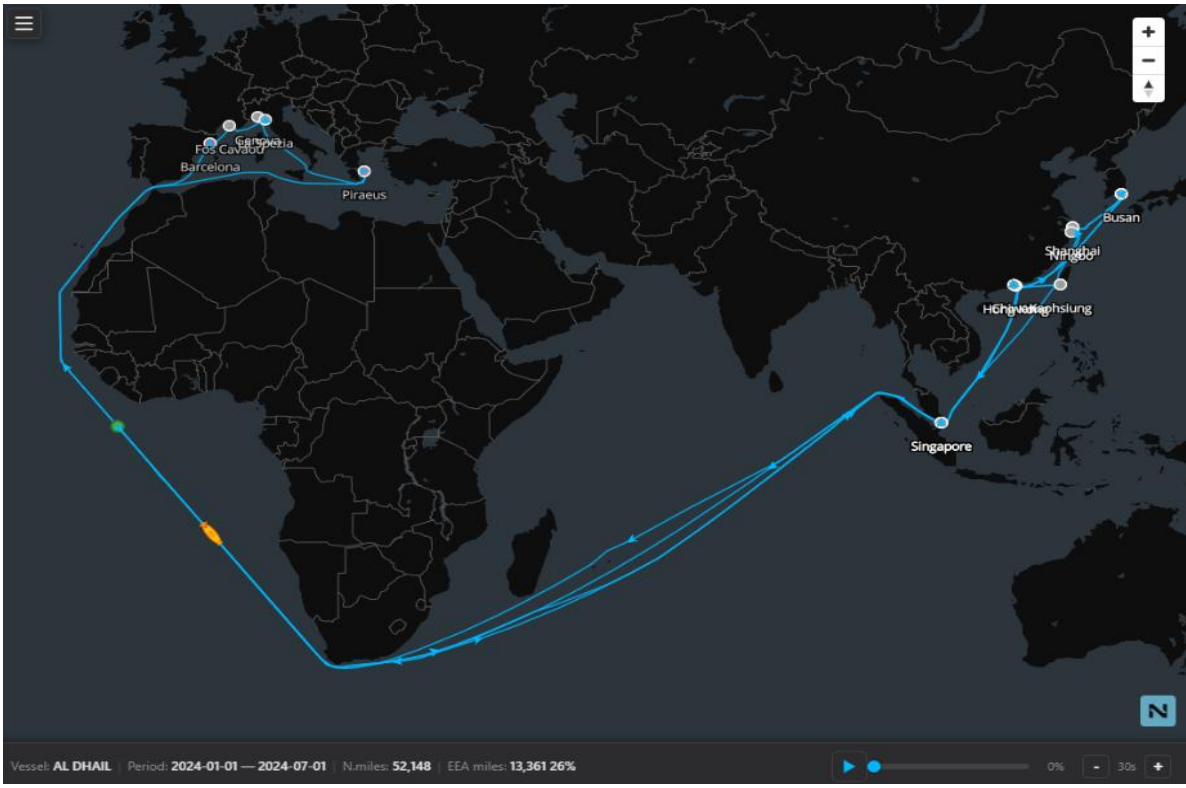
Phase I – Detection / Tier 3 (service/company level) Maritime service transformation

The Red Sea crisis shaping the East Med shipping network: Changes in the route of a vessel from a major shipping line.



2023

Suez-based loop → Piraeus as first Med hub.



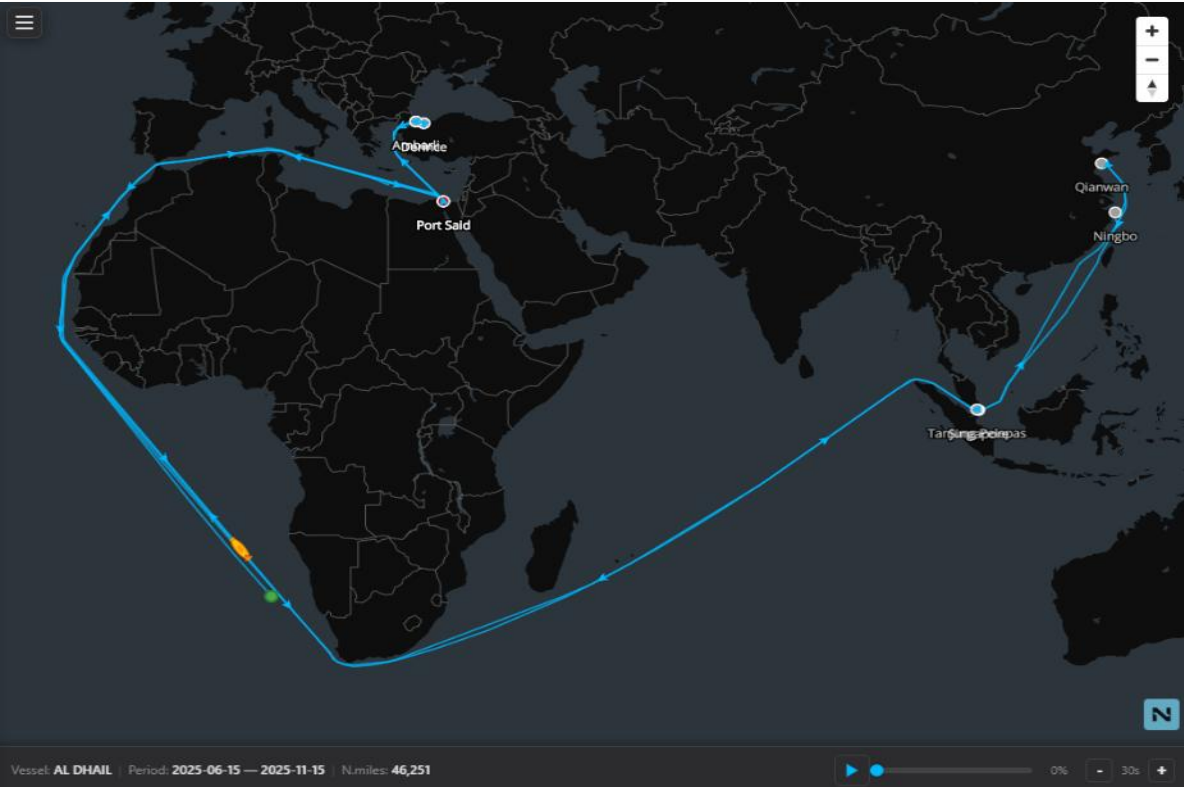
2024

Cape of Good Hope loop → Piraeus retained but with reduced frequency.

Case Study II: Eastern Mediterranean

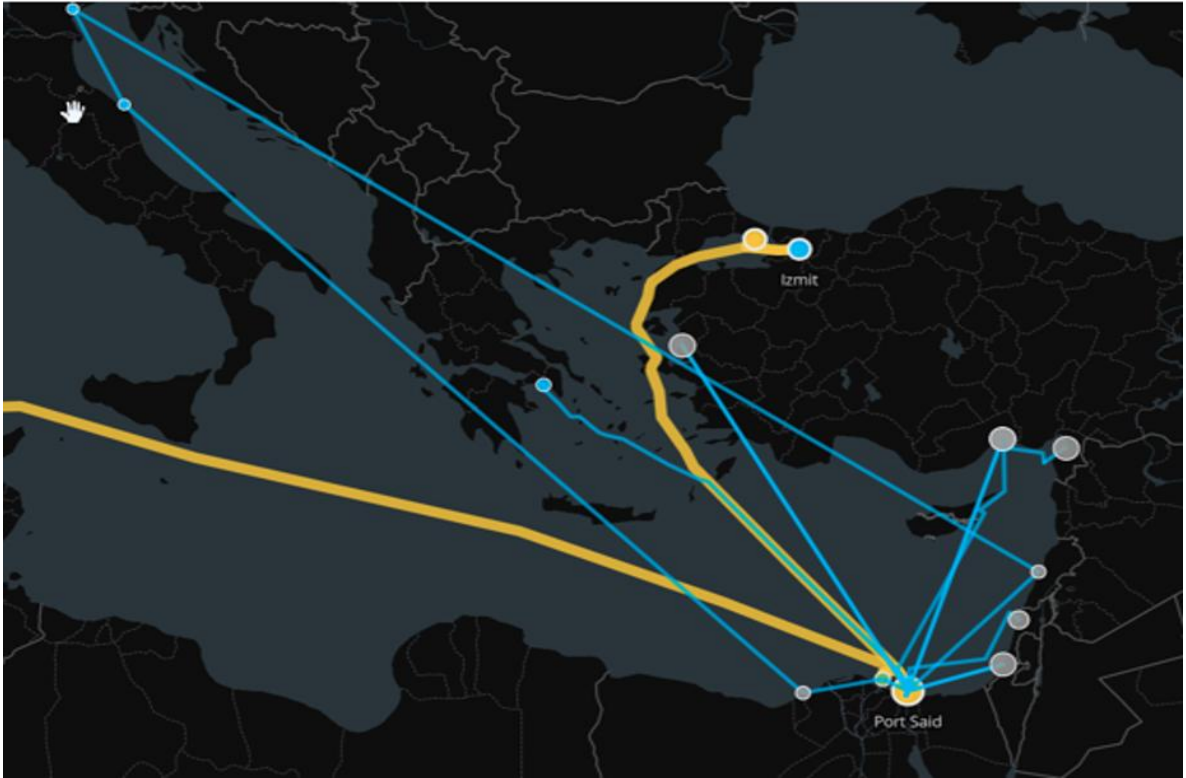
Phase I – Detection / Tier 3 (service/company level) Maritime service transformation.

The Red Sea crisis shaping the East Med shipping network: Changes in the route of a vessel from a major shipping line



2025 (Deep-Sea Service)

Hub shift → increased relay via Egypt/Turkey; Piraeus hub role lost, replaced by Port Said.



2025 (Deep-Sea + feeder services)

Route splitting: Piraeus now connects indirectly to the original deep-sea service via a feeder service through Port Said.

Case Study II: Eastern Mediterranean

Phase I – Detection / Conclusions

Tier	Detection	Findings
Tier 1	Port level Activity	The Eastern Mediterranean was the basin most disrupted by the Red Sea crisis , and deep-sea calls fell sharply at both blocks in late 2023. Non-EU ports then recovered while EU ports stayed flat, and transport work followed the same divergence: Egypt's share of deep-sea kTEU-miles rose from 31% to 45%, while Greece fell from 34% to 13% and Port Said displaced Piraeus as the region's leading gateway . Israel and Turkey also strengthen their position. With long-haul legs now longer and therefore more costly under the ETS, entry and exit to the region is increasingly anchored on non-EU ports.
Tier 2	Network Level structural metrics	Unlike in Northern Europe, the shift is confirmed at cargo level . Transshipment activity has genuinely relocated from EU to non-EU ports, with non-EU hubs overtaking EU ports in March 2025, shortly after Gemini began operations. Direct connectivity to EU destinations fell from around 68% to 50% over 2023–2025, a far steeper erosion than at non-EU ports, while at Piraeus and Gioia Tauro calls by feeder-sized vessels on short legs rose by 14 and 12 pp respectively. The combination — deep-sea work re-anchored on non-EU hubs and EU ports increasingly served by feeders — points beyond a change of port order to a restructuring of the services themselves.
Tier 3	Voyage-Specific behavioural metrics	Growth in Egypt is concentrated in a few carriers: Hapag-Lloyd moved its regional operations there, Yang Ming scaled up tenfold from 2024 to reach around a tenth of regional gateway traffic, and Maersk also gained. Piraeus held a third of the region's gateway traffic in 2023, led by COSCO and Hapag-Lloyd, and holds close to a tenth two years later. The service-level pattern shows how the transition occurred: a loop calling Piraeus as its first Mediterranean hub in 2023 retained the call at reduced frequency once rerouted via the Cape, and by 2025 had shifted its hub role to Port Said, with Piraeus reconnected to the same deep-sea service only indirectly, through a feeder. Yang Ming illustrates the same mechanism in a milder form: it still calls Piraeus regularly, but with prior and subsequent calls at non-EU ports, so its long-haul work is credited to Egyptian gateways with lower ETS cost.

Case Study II: Eastern Mediterranean

Phase II – Attribution / Conclusions

Level	Attribution	Finding
1	Has there been a significant improvement in Egypt's economic activity?	Egypt's GDP and trade volumes have not grown significantly enough to explain the surge in port activity. The increase is not driven by higher Egyptian import/export demand but rather reflects a structural shift in regional transshipment patterns away from Piraeus.
	Has there been a reduction in operating costs at Egyptian or other non-EU ports?	In the current global inflationary environment, there is no evidence that Egyptian ports have achieved meaningful cost reductions relative to Piraeus or other East Med competitors. Port tariffs and handling costs do not seem the differentiating factor driving the traffic shift.
	Do Egyptian or other non-EU ports have better infrastructure or greater capacity?	Piraeus is already a fully-developed hub with adequate capacity. Nevertheless, in Egypt investments have been approved either in new terminals (Abu Qir, Alexandria, and Damietta) or in the expansion of existing ones (Port Said), which will allow total capacity to increase from 10.6 million TEUs per year in 2023 to 19.2 million TEUs per year in 2026, as well as enabling the handling of vessels with capacities exceeding 20,000 TEUs.
	Are there structural congestion problems at EU Eastern Mediterranean ports?	Piraeus has available capacity. EU ports in the Eastern Mediterranean have not presented congestion problems that would force carriers to seek alternatives. Congestion is not pushing traffic to Egypt.

Case Study II: Eastern Mediterranean

Phase II – Attribution / Conclusions

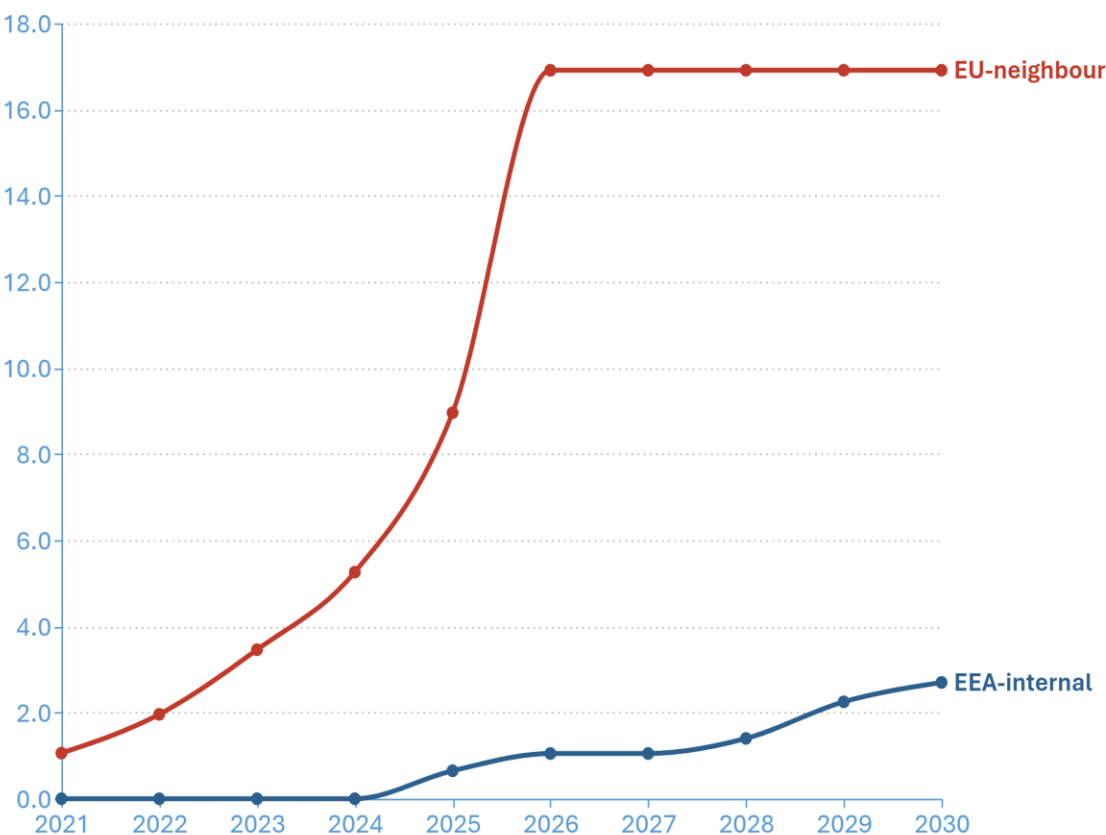
Level	Attribution	Finding
1	Could the expiration of the CBER have given any advantage to non-EU Eastern Mediterranean ports?	In Egypt there are laws and authorities aimed at protecting competition and prohibiting monopolistic practices.
	Could the closure of the Suez Canal have given any advantage to non-EU ports?	With Suez closed, Piraeus should theoretically gain advantage as first Mediterranean call for Cape-routed services entering via Gibraltar—proximity to Suez becomes irrelevant. Yet Egyptian ports continue gaining share, suggesting the shift is driven by other factors beyond geography.
	Is there any other factor that could increase the profitability of a transoceanic service if it makes an intermediate call at Eastern Mediterranean ports?	ETS costs for a single Singapore-Piraeus ULCV voyage increased from €225k to €500k under Cape routing (+120%), more than doubling the regulatory incentive to call non-EU ports first.
2	Quantitative verification	European ports get worse in the two indicators level of transshipment and direct connectivity ratio. Non-EU ports in the region improve in both.

Case Study II: Eastern Mediterranean

Investments in container terminals in European ports vs non-EU ports

Cumulative added capacity 2021–2030

M TEU/year · EU-neighbour vs EEA-internal ports · East Med



Ctry.	Port	Terminal	Inv. €M	Expected Date	Throughput M TEU per year
EG	El-Dekheila	Tahya Misr 2 (Pier 100)	n.d.	2025	1,5
EG	Abu Qir	Hutchison terminal	694	2024	1,6
EG	Ain Sokhna	Hutchison terminal	625	2026	1,7
EG	Damietta	DACT Terminal 2	554	2026	3,3
EG	Port Said	SCCT Phase II	430	2025	2,2
EG	Alexandria	Tahya Misr 1 (CMA)	300	2023	1,5
IL	Haifa	SIPG Bayport	1.438	2021	1,1
IL	Ashdod	Quay 21	400	2022	0,9
TR	Asyaport	Phase 3 quay extension	n.d.	2026	1,5
TR	Mersin	EMH2T expansion	390	2026	1,0
TR	Ambarli	Marport	170	2024	0,2
Total non-EU			5.001		16,5
HR	Rijeka	Rijeka Gateway Phase 1	380	2025	0,6
MT	Marsaxlokk	T2 Squaring Off	56	2026	0,4
HR	Rijeka	Rijeka Gateway Phase 2	n.d.	2028	0,35
GR	Thessaloniki	Pier 6 expansion	196	2029	0,85
IT	Trieste	Pier VIII (HHLA PLT)	316	2030	0,45
Total EEA			948		2,70

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Case Study III: Western Mediterranean



● EEA Ports of EEA countries.

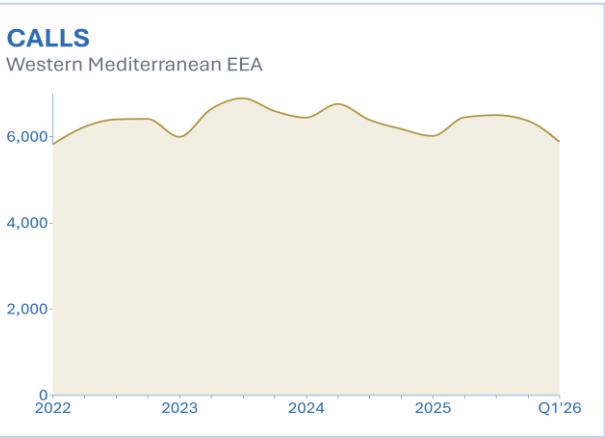
● EEA+ Ports of neighbouring countries.
All neighbouring ports are within 300 miles.

Case Study III: Western Mediterranean

Phase I – Detection / Tier 1 (High level analysis). Evolution over time in the number of container vessel port-calls

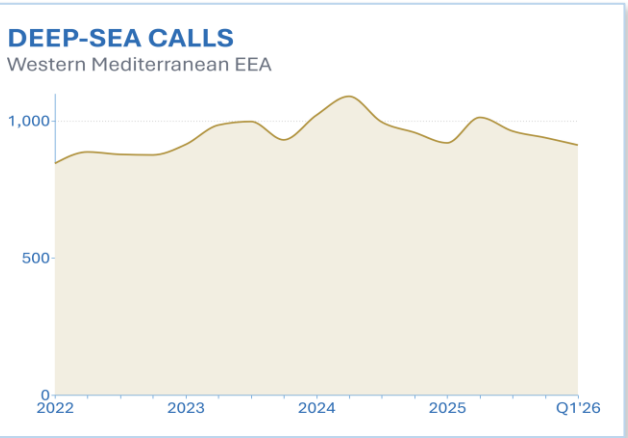
EUROMED

ALL CONTAINER SHIPPING ROUTES



EUROMED GATEWAY

DEEP-SEA CONTAINER SHIPPING ROUTES

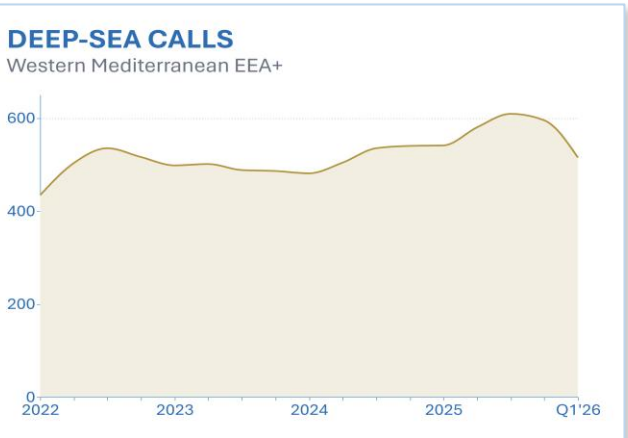
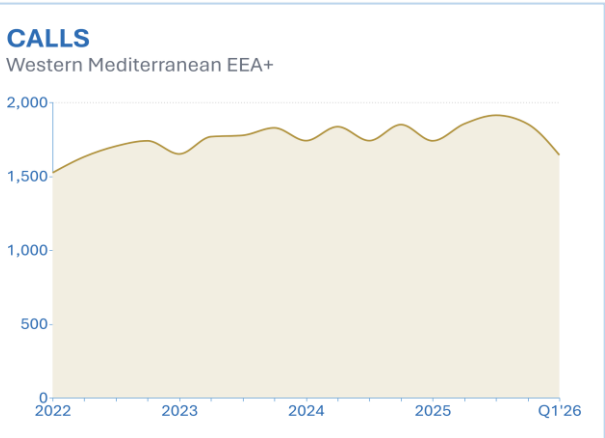


When considering the full range of container shipping routes, port calls at EEA ports in the Western Mediterranean remain broadly stable, although a gradual downward trend is visible from the second half of 2023 onwards. By contrast, EEA+ ports show a generally positive evolution through 2025, followed by a marked decline in the first quarter of 2026.

Deep-sea calls at EEA ports reached a peak in 2023 but subsequently declined and remained below that level throughout most of the following period. EEA+ ports display a more resilient pattern.

EEA PORTS

EEA+ PORTS



Overall, the figures suggest a relative strengthening of neighbouring non-EEA gateway ports within the Western Mediterranean, particularly for deep-sea services.

Case Study III: Western Mediterranean

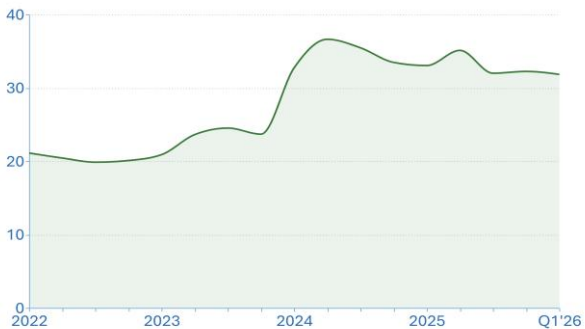
Phase I – Detection / Tier 1 (High level analysis). Evolution over time of the TEU_Mile indicator

EUROMED

ALL CONTAINER SHIPPING ROUTES

kTEU MILES

Western Mediterranean EEA

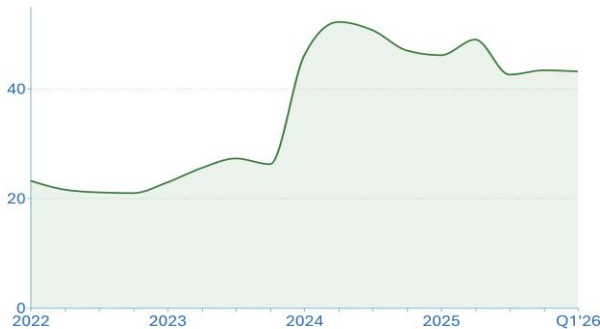


EUROMED GATEWAY

DEEP-SEA CONTAINER SHIPPING ROUTES

DEEP-SEA kTEU MILES

Western Mediterranean EEA

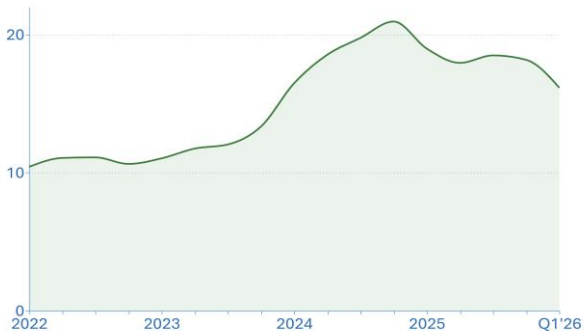


EEA PORTS

EEA+ PORTS

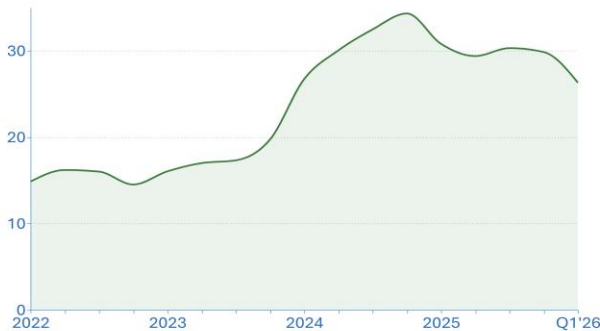
kTEU MILES

Western Mediterranean EEA+



DEEP-SEA kTEU MILES

Western Mediterranean EEA+



When considering all container shipping routes, transport work measured in kTEU miles increases markedly in both EEA and EEA+ ports from late 2023 onwards. The rise is stronger in EEA ports, which reach a substantially higher level in 2024 before stabilising and gradually declining through 2025 and early 2026.

A similar pattern is observed for deep-sea traffic. Both groups record a sharp increase in deep-sea kTEU miles around 2024, followed by a progressive correction. EEA ports remain at a significantly higher level than before the increase, while EEA+ ports show a more pronounced decline towards the end of the period.

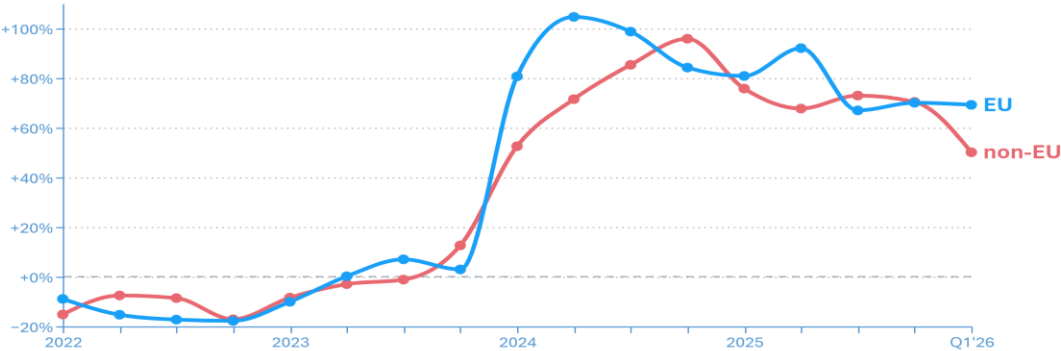
Overall, the figures suggest a broad increase in gateway activity across the Western Mediterranean, followed by a partial normalisation in both groups.

Case Study III: Western Mediterranean

Phase I – Detection / Tier 1 (high level scope). Evolution over time of the TEU_Mile and share_TEU_Mile indicators

DEEP-SEA kTEU MILES GROWTH

kTEU-miles · % vs 2023 average



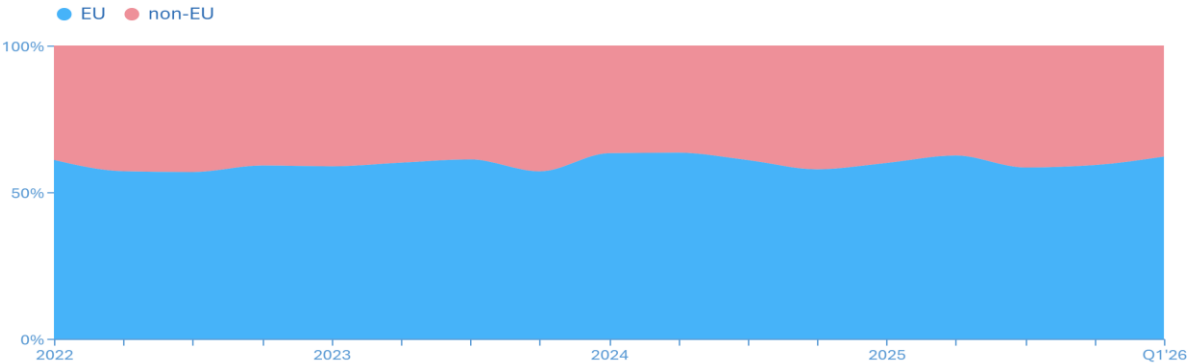
EUROMED GATEWAY

Deep-sea transport work increased sharply across both EU and non-EU ports in the Western Mediterranean from early 2024 onwards.

EU ports recorded the earlier and stronger increase and remained at a higher growth level by Q1 2026. Despite these fluctuations, the distribution of transport work between the two groups remained broadly stable, with EU ports consistently accounting for around 60% of total deep-sea kTEU miles.

DEEP-SEA TRANSPORT WORK SHARE

kTEU-miles

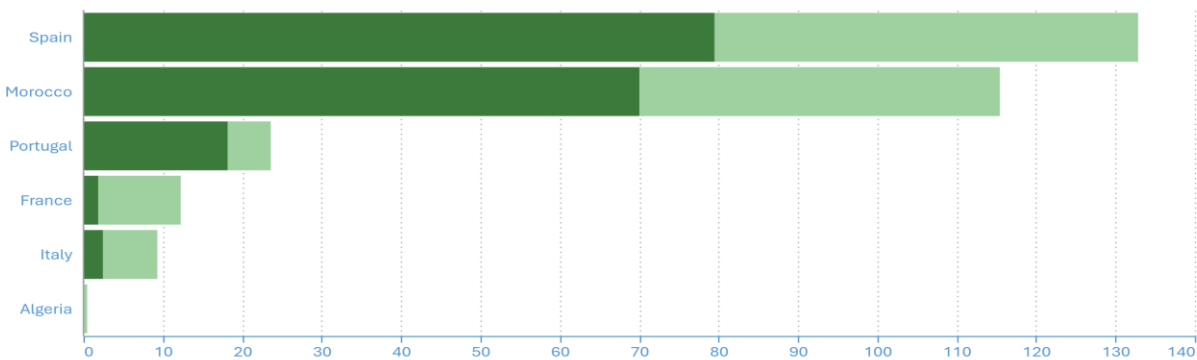


Case Study III: Western Mediterranean

Phase I – Detection / Tier 1 (high level scope). Evolution over time of the TEU_Mile and share_TEU_Mile indicators by country

kTEU MILES

2023 + Δ 2025-26

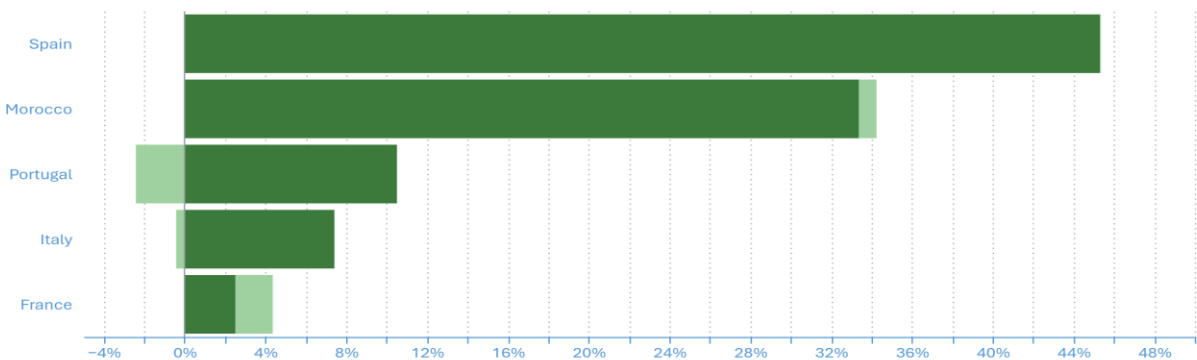


EUROMED GATEWAY

Spain and Morocco clearly dominate Western Mediterranean gateway activity. Spain remains the leading market, while Morocco records the strongest growth in both kTEU miles and port calls. Overall, the region shows increasing concentration around these two gateways, with limited gains elsewhere.

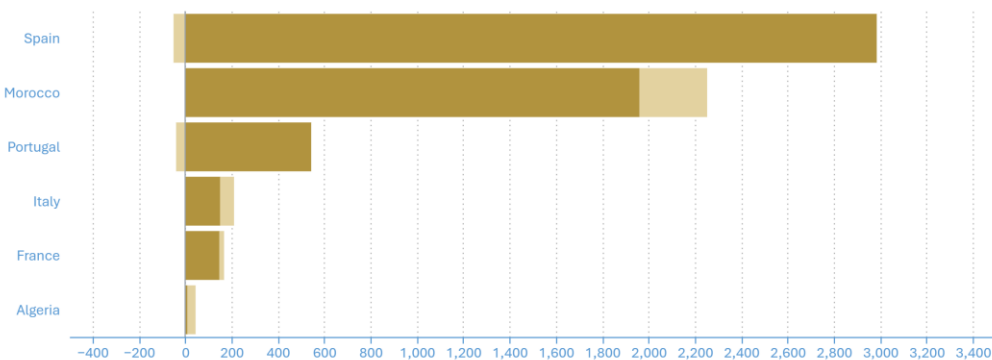
kTEU MILES SHARE

2023 + Δ 2025-26



CALLS

2023 + Δ 2025-26



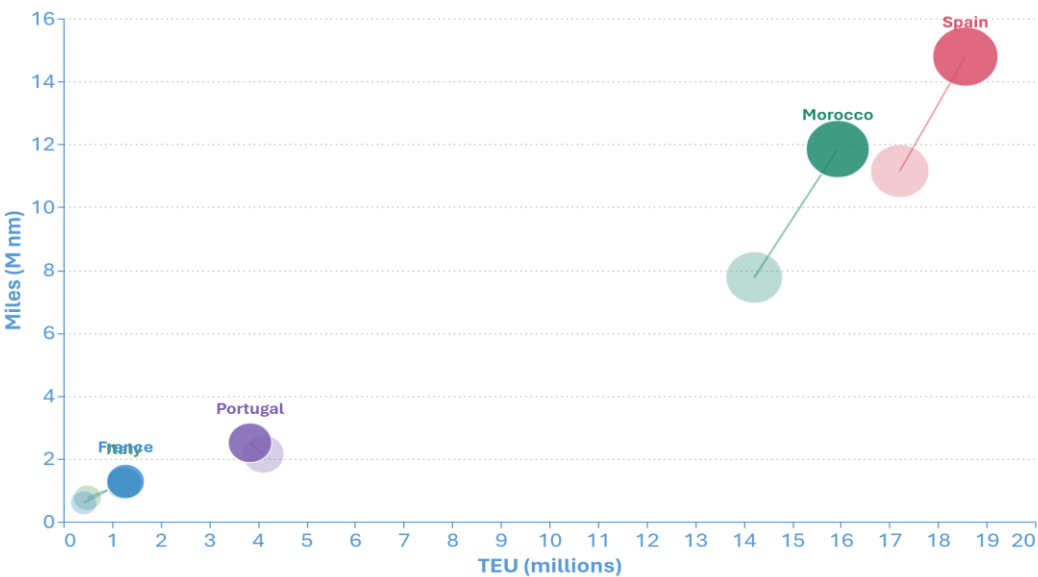
Case Study III: Western Mediterranean

Phase I – Detection / Tier 1 (high level scope). Evolution over time of the TEU_Mile and share_TEU_Mile indicators by country

EUROMED GATEWAY

TEU VS MILES EVOLUTION

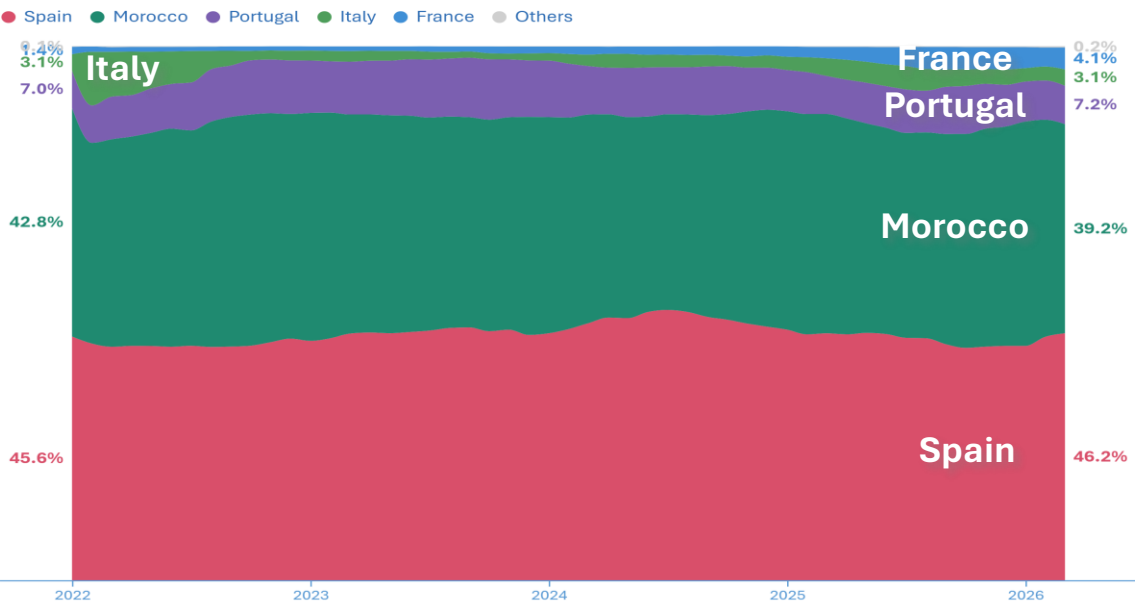
2023 → 2025-26 · size = kTEU·miles



Spain and Morocco remain the dominant gateways, with both increasing transport work through higher volumes and longer sailing distances. Spain records the strongest overall expansion.

MARKET SHARE

kTEU·miles share



The market structure remains broadly stable: Spain slightly strengthens its leadership, while Morocco loses some share despite continued growth. The remaining countries retain a limited and broadly unchanged position.

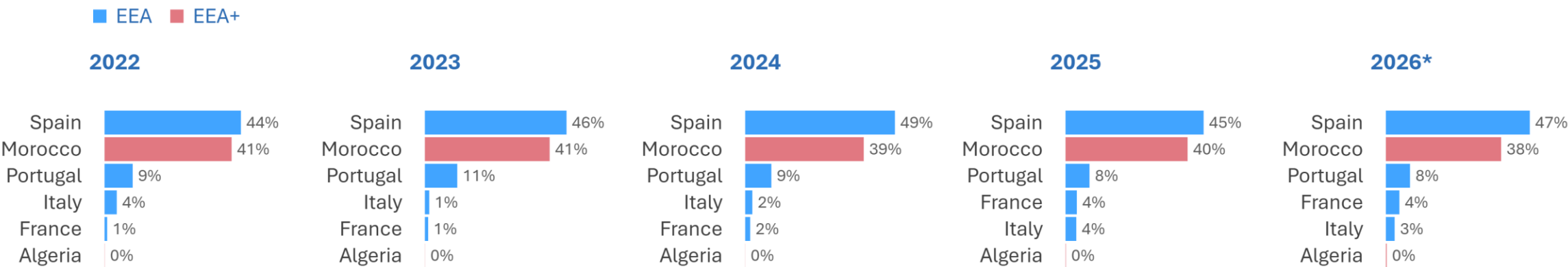
Case Study III: Western Mediterranean

Phase I – Detection / Tier 1 (high level scope) Evolution over time of the TEU_Mile and share_TEU_Mile indicators by country

EUROMED GATEWAY

DEEP-SEA TRAFFIC SHARE BY COUNTRY

kTEU·miles



Spain remains the leading Western Mediterranean gateway, increasing its share from 44% in 2022 to 47% in 2026. Morocco retains a strong second position but gradually declines from 41% to 38%. Portugal also loses some relative weight, while France and Italy remain marginal. Overall, the market structure is highly concentrated and broadly stable, with a slight shift in favour of Spain.

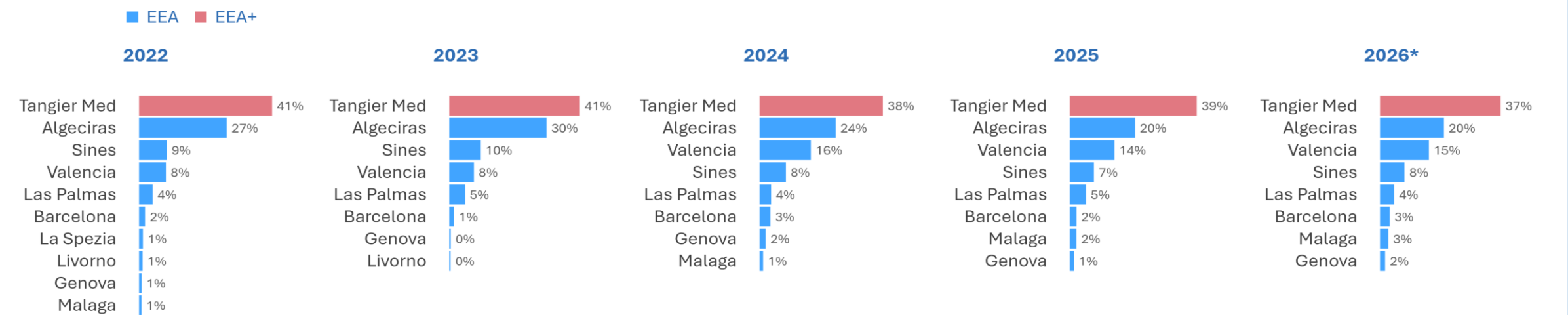
Case Study III: Western Mediterranean

Phase I – Detection / Tier 1 (high level scope) Evolution over time of the TEU_Mile and share_TEU_Mile indicators by port

EUROMED GATEWAY

DEEP-SEA TRAFFIC SHARE BY PORT

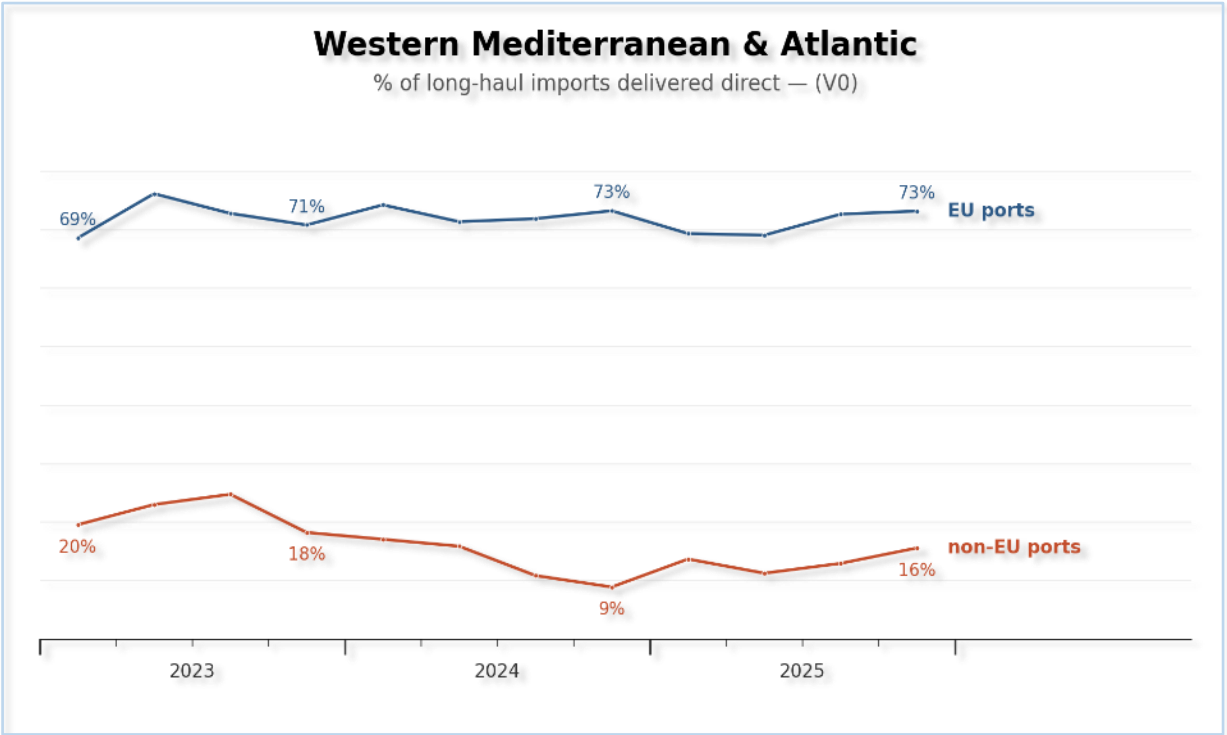
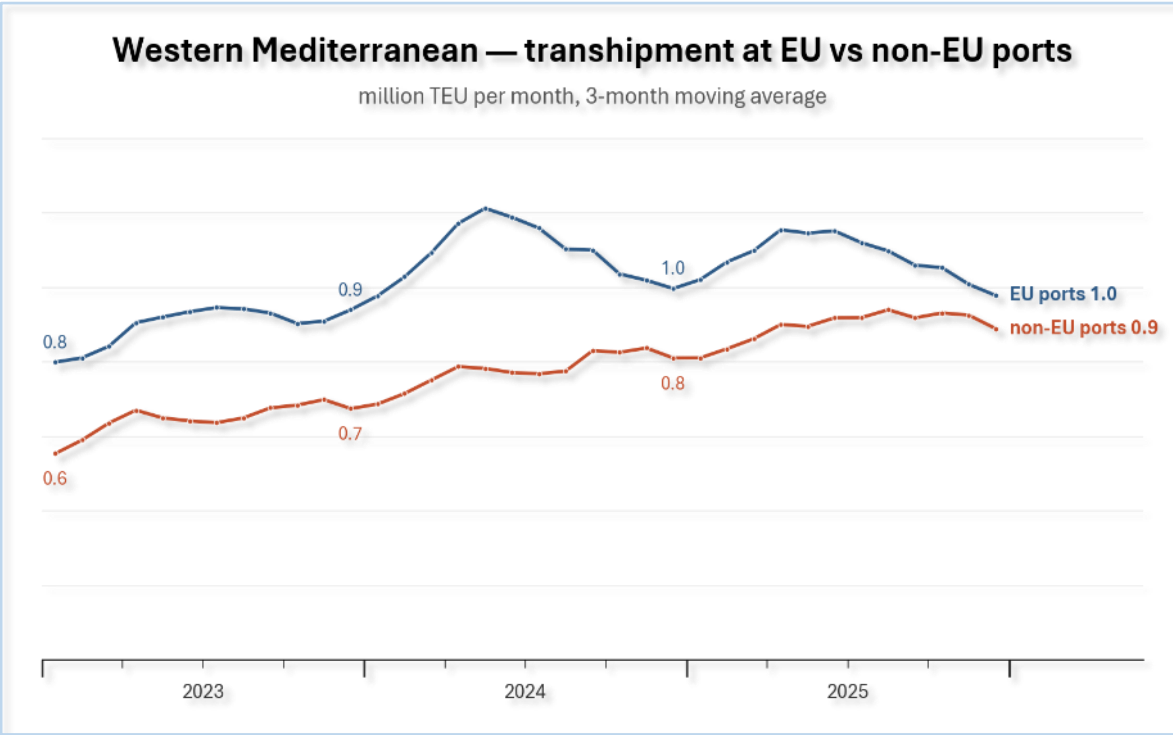
deep-sea kTEU·miles · West Med + Atlantic · ranking by year (2022–2025 + 2026*)



Tangier Med remains the leading Western Mediterranean gateway throughout the period, although its share declines slightly from 41% in 2022 to 37% in 2026. Algeciras also loses relative weight, while Valencia strengthens markedly, rising from 8% to 15%. Overall, the market remains highly concentrated, but activity is gradually becoming more balanced across the main EEA gateways.

Case Study III: Western Mediterranean

Phase I – Detection / Tier 2. Evolution over time of Transshipment and Direct Connectivity using the *container tracking dataset**



Non-EU transshipment has grown by around 60% since early 2023, while EU volumes — after peaking in mid-2024 — have remained broadly flat at around 1.0 million. EU ports have not lost transshipment traffic in absolute terms, **but they are gradually losing their share of the region’s total transshipment traffic.**

The Western Mediterranean and the Atlantic show the widest and most stable gap between the blocks across the three basins. EU gateway ports have increased their direct connectivity ratio from 69% to 73%, while non-EU ports—Morocco and Algeria—operate under a different dynamic, and Tangier Med functions mainly as a transshipment port (approximately 97%).

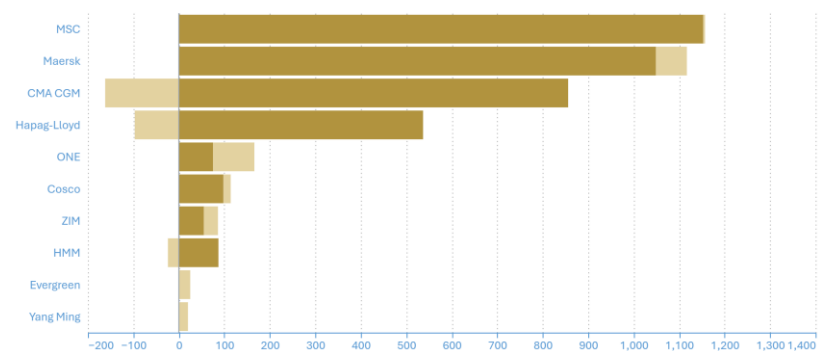
* Source: EconDB

Case Study III: Western Mediterranean

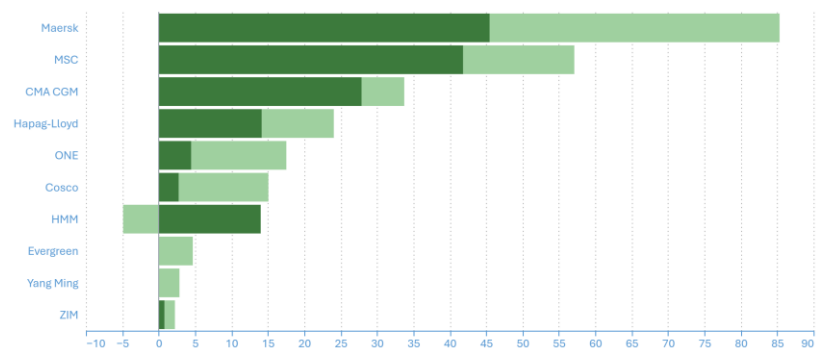
Phase I – Detection / Tier 3 (service/company level)

EUROMED GATEWAY

CALLS BY OPERATOR
2023 + Δ 2025-26

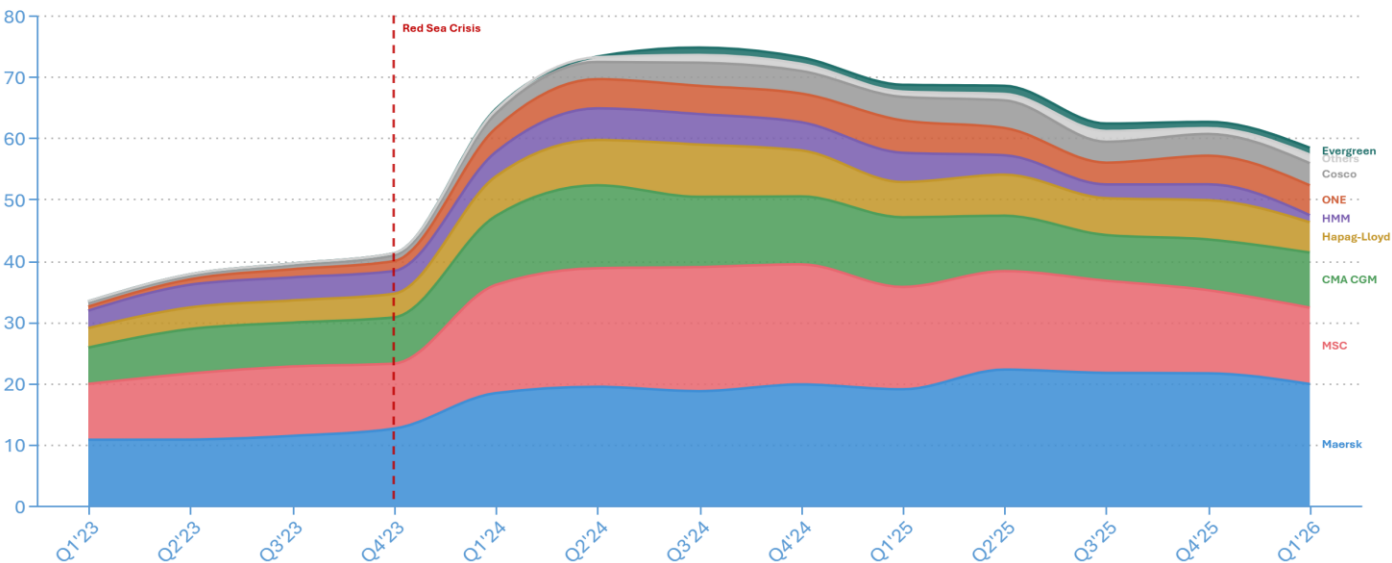


kTEU-MILES BY OPERATOR
2023 + Δ 2025-26



Compared with 2023, deep-sea activity increased significantly across the leading operators, with Maersk and MSC driving most of the growth in both calls and kTEU miles. CMA CGM and Hapag-Lloyd also strengthened their contribution.

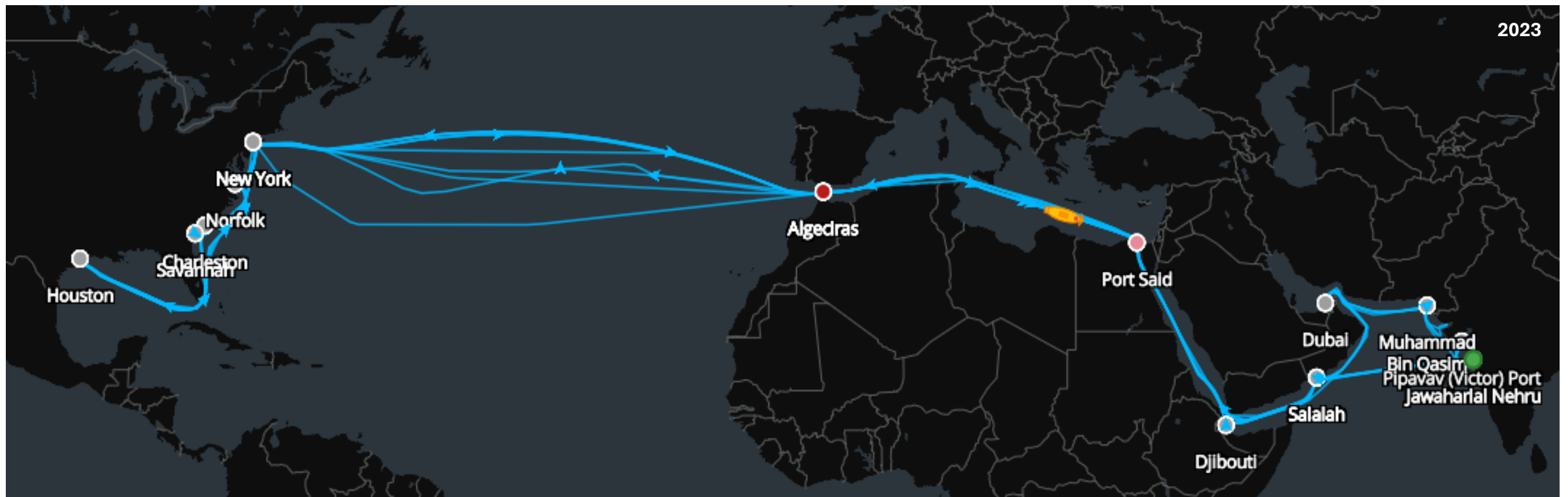
kTEU-MILES BY OPERATOR
Top operators



Case Study III: Western Mediterranean

Phase I – Detection / Tier 3 (service/company level) Maritime service transformation (1 / 2)

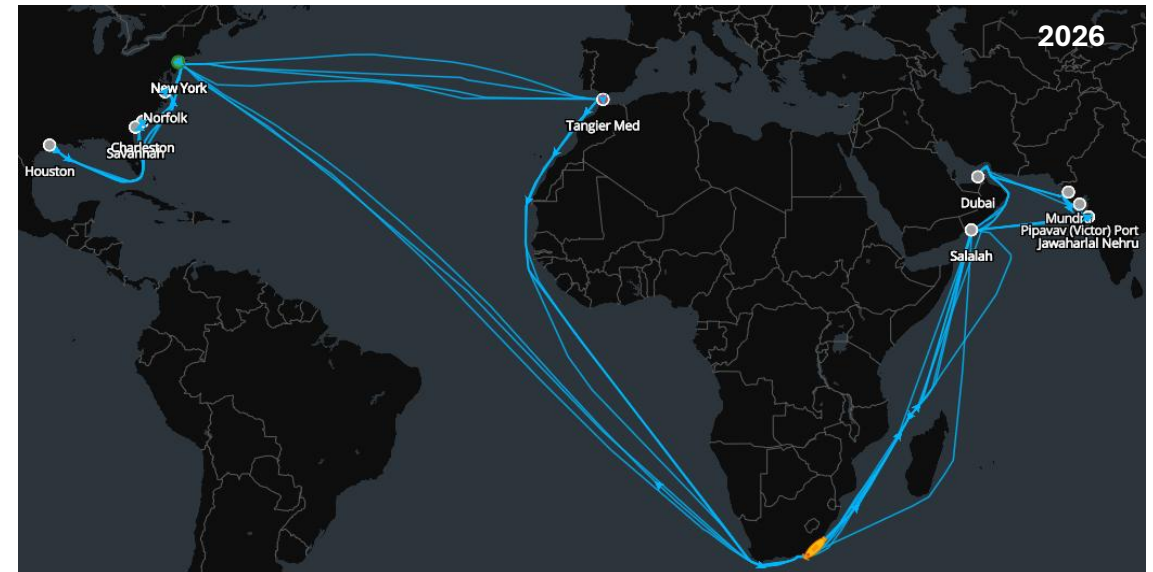
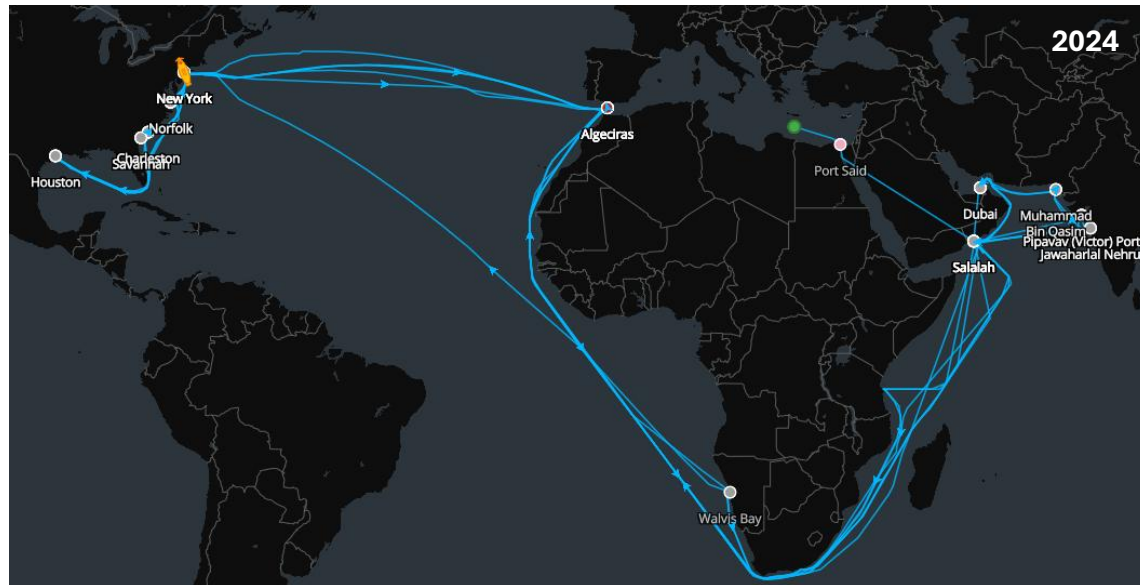
Maersk's MECL service links the US East Coast with the Middle East and India, historically calling at Algeciras in both directions as its European relay hub. The Red Sea crisis, which forced the service around the Cape of Good Hope, doubled its ETS exposure to €33M per year and triggered a rapid reconfiguration. In late 2024 the westbound call was moved from Algeciras to Tangier Med, halving the ETS cost. In 2025 the eastbound leg became direct, and the remaining Algeciras call was dropped,— leaving a service that once generated €16–33M in annual ETS costs with no European exposure at all.



Case Study III: Western Mediterranean

Phase I – Detection / Tier 3 (service/company level) Maritime service transformation (2 / 2).

Maersk's MECL service links the US East Coast with the Middle East and India, historically calling at Algeciras in both directions as its European relay hub. The Red Sea crisis, which forced the service around the Cape of Good Hope, doubled its ETS exposure to €33M per year and triggered a rapid reconfiguration. In late 2024 the westbound call was moved from Algeciras to Tangier Med, halving the ETS cost. In 2025 the eastbound leg became direct, and the remaining Algeciras call was dropped,— leaving a service that once generated €16–33M in annual ETS costs with no European exposure at all.



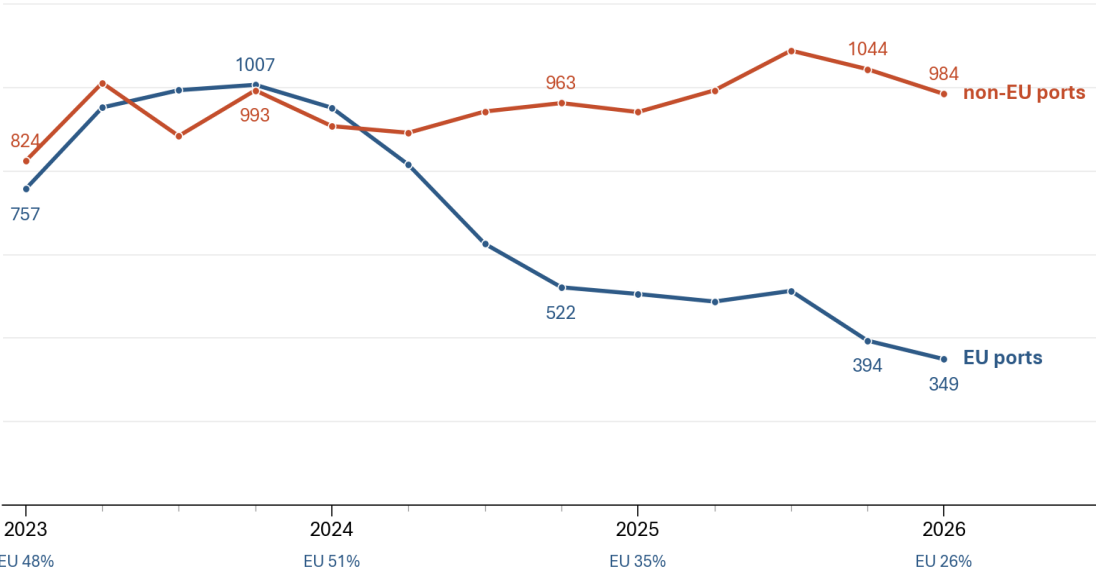
Since maritime transport was included in the EU ETS, relay connections at EU ports between deep-sea services linking Asia and the Americas have shifted to non-EU ports.

Case Study III: Western Mediterranean

Pure relay — transshipment at a EUROMED port whose origin and destination both lie outside EUROMED

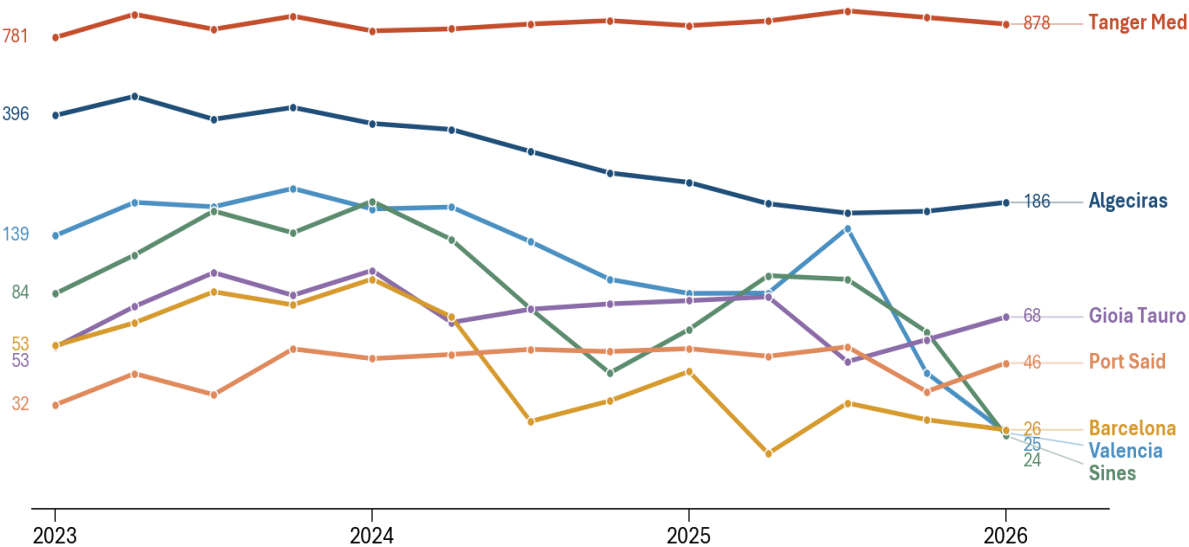
Pure relay at EUROMED ports — EU vs non-EU ports

thousand TEU relayed between two remote regions, per quarter



Pure relay at EUROMED ports — the leading hubs

thousand TEU relayed per quarter, log scale, hubs ranked by 2023 volume



The Suez disruption has shrunk the basin-wide market — from 1.87 to 1.33 million TEU per quarter — and the contraction falls almost entirely on EU ports while non-EU volumes hold flat. The EU share drops from 51 % to 26 %, and Algeciras, the largest EU relay hub at the outset, gives up most. Tanger Med, facing it across the same strait and serving the same position on the Cape-routed network, does not decline at all. Geography cannot separate them; the ETS cost of a relay call on the European shore can.

Case Study III: Western Mediterranean

Phase I – Detection / Conclusions

Tier	Detection	Findings
Tier 1	Port level Activity	The Western Mediterranean was the basin that benefited most from Cape rerouting , with long-haul transport work growing by around three quarters as Asia, India and Middle East traffic shifted to the Gibraltar Strait. The distribution between blocks nonetheless remained somehow stable, with EU ports holding close to 60% of deep-sea kTEU-miles throughout but losing share in the transshipment market where growth was captured unevenly: Tangier Med consolidated its position as the region's leading hub reaching maximum capacity while Valencia, Algeciras other EU ports grew far below the market.
Tier 2	Network Level structural metrics	The network keeps serving the same hinterland, but its interchange node has moved across the Strait. EU ports have not lost transshipment in absolute terms — volumes are flat rather than falling — yet non-EU transshipment has grown by around 60% since early 2023 , so the EU share of the regional relay business erodes without any visible loss. Direct connectivity at EU gateways did not deteriorate ; it improved slightly, confirming that import and export flows remain intact. The erosion is confined to third-country relay, the segment with neither origin nor destination in the region: at Algeciras it has halved as a share of its transshipment mix, while Tangier Med retained its own relay volume in full.
Tier 3	Voyage-Specific behavioural metrics	Growth is concentrated in two carriers: Maersk, which doubled its volumes at both its Tangier Med and Algeciras hubs, and Hapag-Lloyd, which quadrupled its Tangier Med operations; CMA CGM and MSC lost relative weight. Maersk's MECL service shows the end state of relocating a relay call to the non-EU shore : an East Coast US–Middle East and India route that relayed at Algeciras in both directions and whose ETS exposure doubled to €33M per year under Cape routing, now runs with no European call and no ETS exposure at all. The service was not split or interrupted — it kept its trade and its frequency and relocated only its interchange point with zero ETS cost.

Case Study III: Western Mediterranean

Phase II – Attribution / Conclusions

Level	Attribution	Finding
1	Has there been a significant improvement in Morocco’s economic activity?	Morocco has outperformed its northern neighbours — GDP grew 3.7–4.6% per year in 2023–2025, against 0.5–3.5% in Spain, Portugal, France and Italy (World Bank). However, the differential is an order of magnitude too small to explain the observed shift: cumulative Moroccan growth of ~9% over two years cannot justify a 64% increase in Tangier Med volumes, and Morocco's trade-to-GDP ratio has remained flat at ~75% since 2023, indicating that its foreign trade grew in line with the economy, not above it. More fundamentally, Tangier Med is primarily a transshipment hub whose throughput is largely disconnected from Moroccan import/export demand. The traffic shift is not demand-driven but reflects a supply-side reorganization of the network.
	Has there been a reduction in operating costs at Tangier Med or other non-EU ports?	There is no evidence of reduction of handling costs nor port tariffs at Tangier Med relative to its EU competitors in the period; port-level cost arbitrage does not explain the inflection observed since 2023. What Tangier Med offers is scale and specialization: the Mediterranean's largest container facility, operating as an almost pure transshipment platform (97% in 2025). These advantages explain the port's ability to absorb the traffic shift — not why the traffic moved.
	Do ports Morocco or other non-EU have better infrastructure or greater capacity?	Yes, and the timing is relevant. Tangier Med brought major new capacity into production precisely within the observation window: the successive TC4 extensions added 3 million TEU per year between 2023 and 2025 — capacity that was available exactly when Cape rerouting reshaped the network. The expansion of the non-EU shore continues with greenfield projects: the Nador West Med complex (three terminals, 2026–2029, largely carrier-affiliated — TIL-MSC, CMA CGM) and the new Atlantic port of Dakhla.

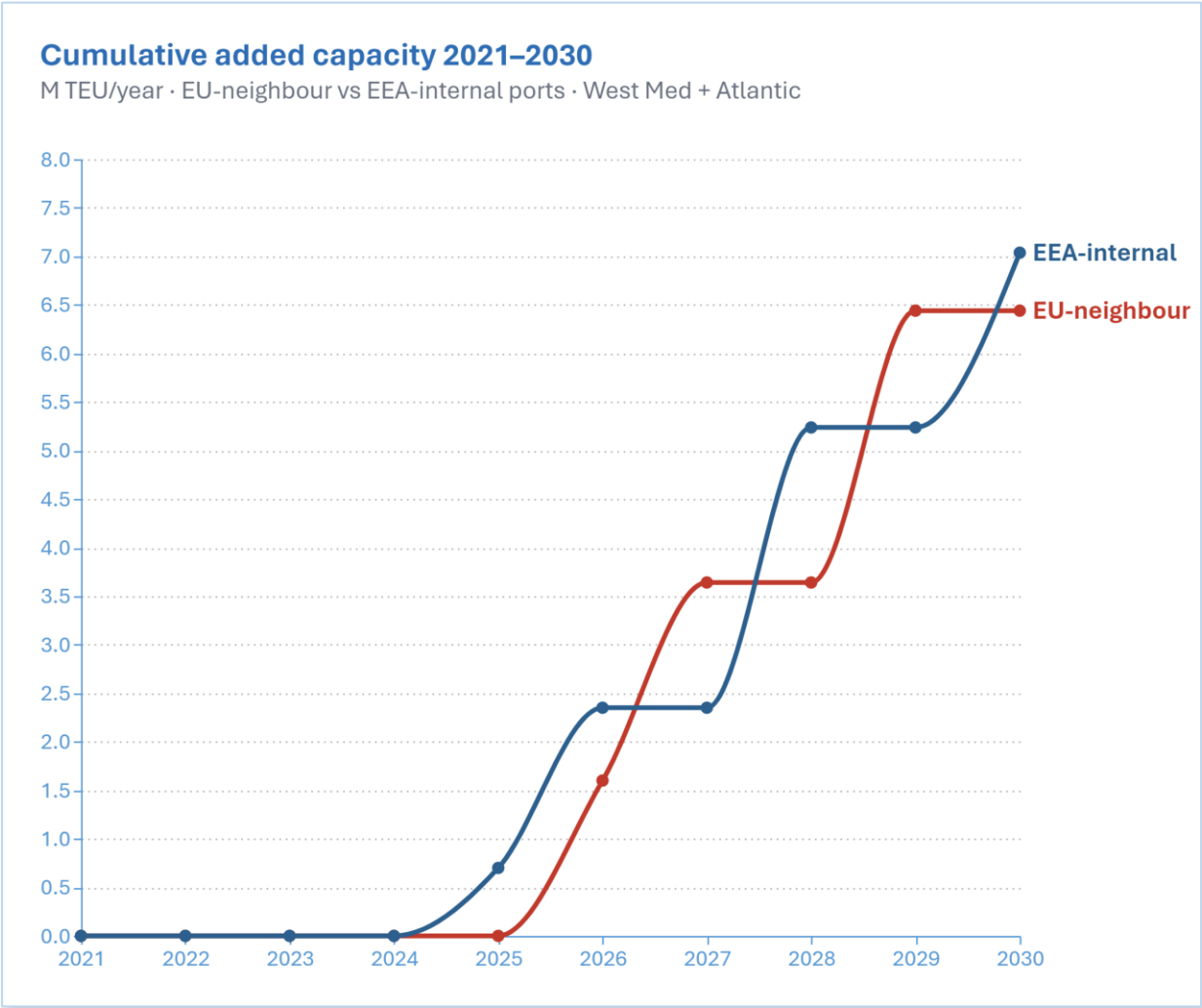
Case Study III: Western Mediterranean

Phase II – Attribution / Conclusions

Level	Attribution	Finding
	Are there structural congestion problems at EU Western Mediterranean ports?	Algeciras operates below its recent peaks — transshipment fell from 5.2 to 4.6 M TEU — and Valencia absorbed a threefold increase in gateway traffic within the window. Congestion is not pushing traffic to Tangier Med.
1	Could the expiration of the CBER have given any advantage to non-EU Western Mediterranean ports?	In Morocco there are laws and authorities aimed at protecting competition and prohibiting monopolistic practices (Law 104-12; Conseil de la Concurrence). Relocating a relay call from an EU to a non-EU hub is thus an internal decision within the carrier's own network, executed without commercial friction — as Maersk's MECL move illustrates.
	Could the closure of the Suez Canal have given any advantage to non-EU ports?	Cape routing shifted the network's centre of gravity to the Strait of Gibraltar, now the first Mediterranean entry point for Asia–Europe services — this explains the basin's 76% traffic growth, but not its distribution: the geographic advantage is shared by Tangier Med and Algeciras, which face each other across the Strait. Geography cannot explain why the additional traffic concentrated on the non-EU shore.
	Is there any other factor that could increase the profitability of a transoceanic service if it makes an intermediate call at Western Mediterranean ports?	The ETS cost emerges as a highly probable cause of the restructuring of interlining services: by relocating relay calls to the non-EU shore, continuing services are transformed into configurations exempt from ETS exposure. The reconfiguration of Maersk's MECL — €16–33M per year of ETS cost eliminated without breaking the service — provides a first quantified verification at service level.
2	Quantitative verification	European gateways maintain connectivity ratio, but loose share in the transshipment market

Case Study III: Western Mediterranean

Investments in container terminals in non-UE Western Mediterranean Ports



Ctry.	Port	Terminal	Inv. €M	Expected Date	C. M TEU
MA	Nador West Med	Port infrastructure (greenfield)	893	2026	
MA	Nador West Med	East Terminal Ph.1 (Marsa Maroc/TIL-MSC)	253	2026	1,6
MA	Nador West Med	West Terminal (Marsa Maroc/CMA CGM)	250	2027	1,8
DZ	Skikda	New container terminal	n.d.	2027	0,2
MA	Nador West Med	East Terminal Ph.2	n.d.	2029	1,8
MA	Dakhla Atlantique	New Atlantic port	1.400	2029	1
Total non-EU			2.796		6,4
ES	Barcelona	Hutchison BEST expansion	60	2025	0,7
FR	Marseille	Fos 2XL Nord extension	217	2026	0,5
IT	La Spezia	LSCT expansion	200	2026	1,1
ES	Valencia	Terminal Norte (MSC-TIL)	1.564	2028	2,4
ES	Algeciras	TTI Phase 1 (Isla Verde)	150	2028	0,5
PT	Sines	Terminal XXI expansion	547	2030	1,8
Total EU			2.738		7,04

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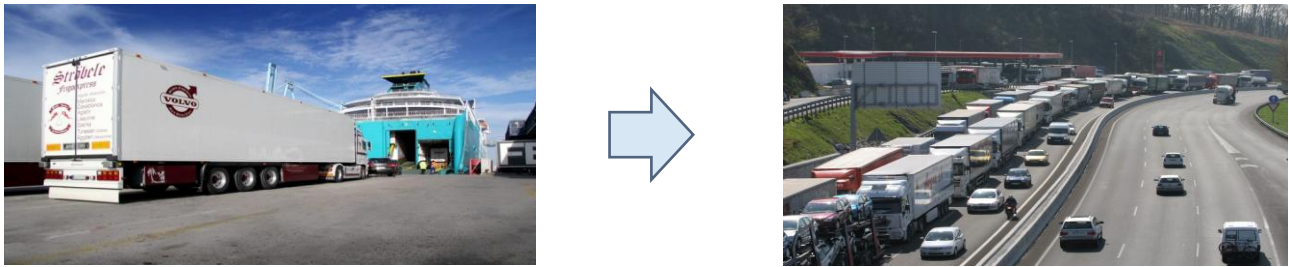
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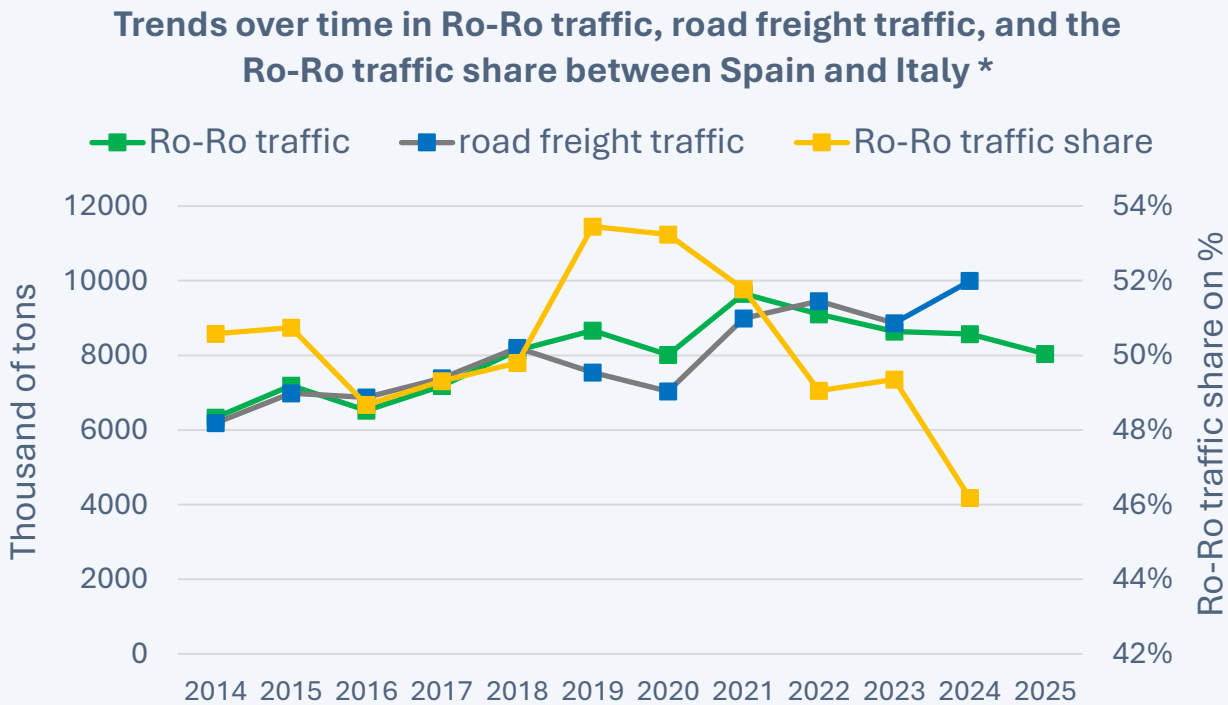
Risk of modal backshift from sea to road



During the 2019–2020 period, the modal share of ro-ro traffic increased by four percentage points. However, between 2020 and 2021, this indicator declined by six percentage points. This marked upward and downward fluctuation was likely influenced by the effects of the COVID-19 crisis.

Nevertheless, a slight recovery in the ro-ro traffic share was observed during 2023. This was followed by a sharp decline of three percentage points in 2024. At present, it is not possible to assess either the persistence or the magnitude of this downward trend due to the unavailability of road freight transport data for 2025.

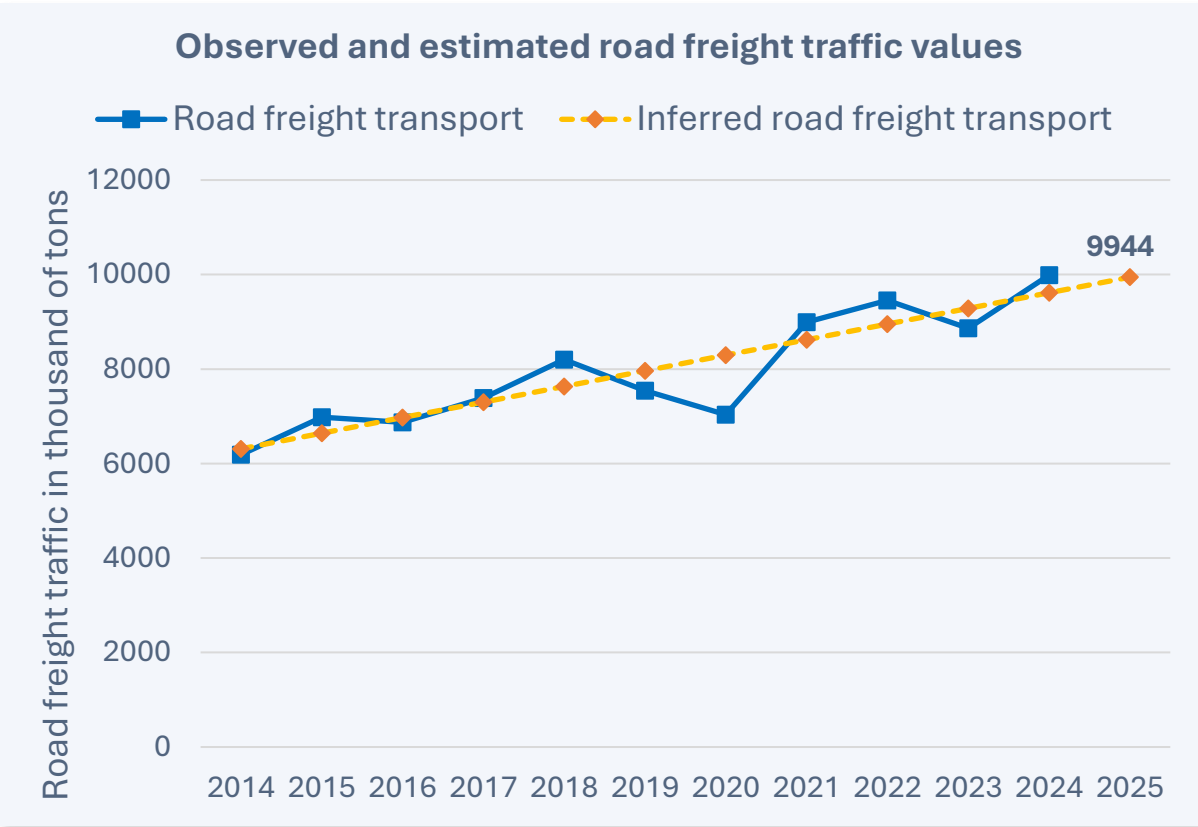
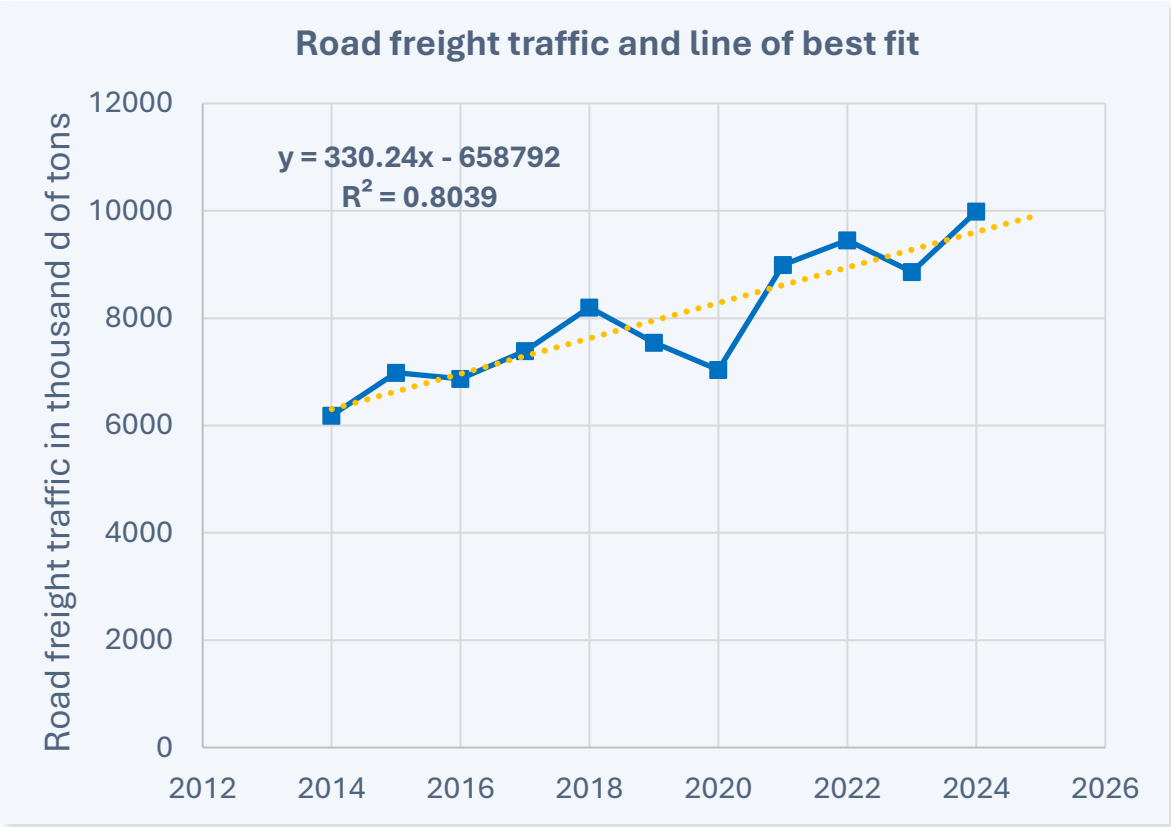
In this context, until observed data for 2025 become available, it is proposed that the likely value of the indicator be estimated using two complementary approaches. The first is based on an analysis of the growth trend in the historical road freight traffic time series. The second relies on the strong correlation between this indicator and the average chain-linked gross domestic product of Spain and Italy.



* Data provided by the Spanish Shortsea Promotion Center (SPC-Spain)

Case Study IV: RoRo Traffic on the Spain - Italy Corridor

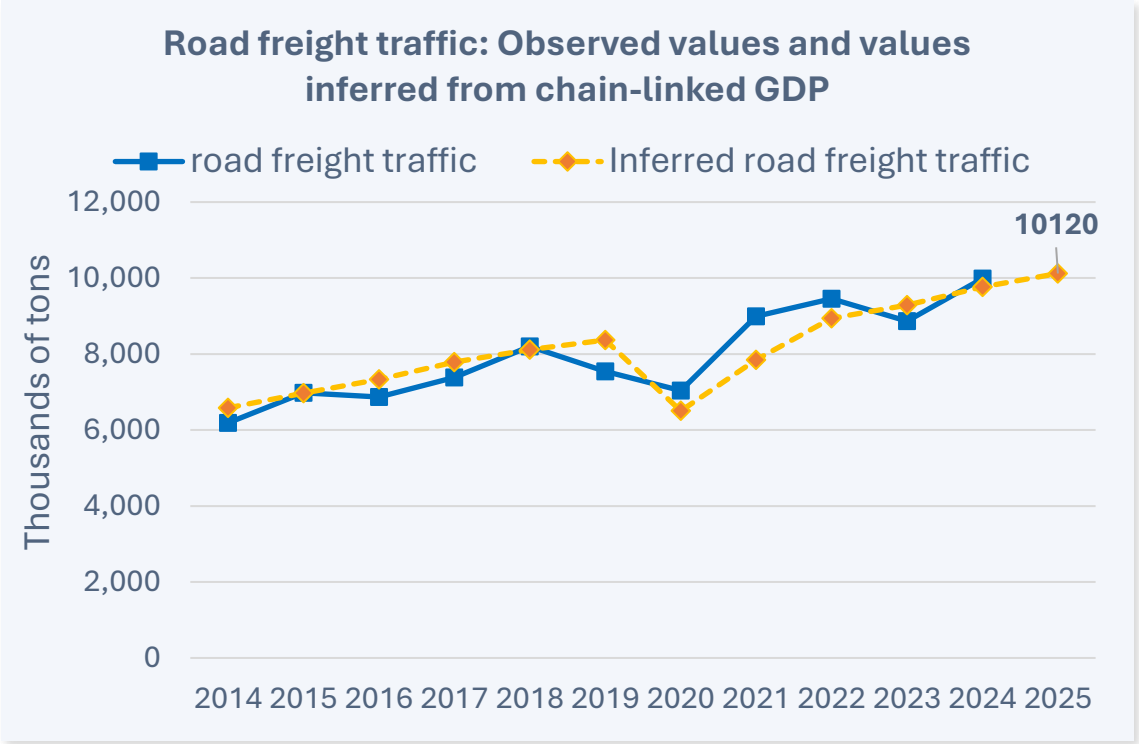
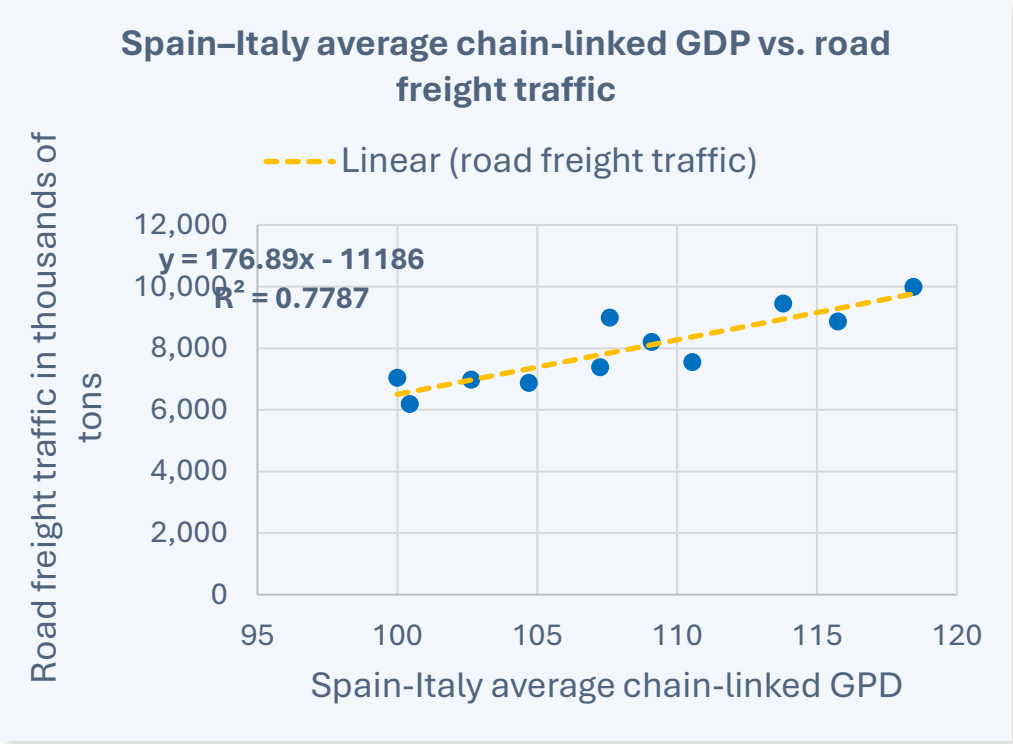
Variation over time of Ro-Ro traffic between Spain and Italy



The road freight transport time series exhibits a clear upward trend, which can be appropriately modelled using a linear regression, with a coefficient of determination (R^2) of 0.80. Based on the resulting regression line, the volume of goods transported by road in 2025 is estimated to reach approximately 9.9 million tons.

Case Study IV: RoRo Traffic on the Spain - Italy Corridor

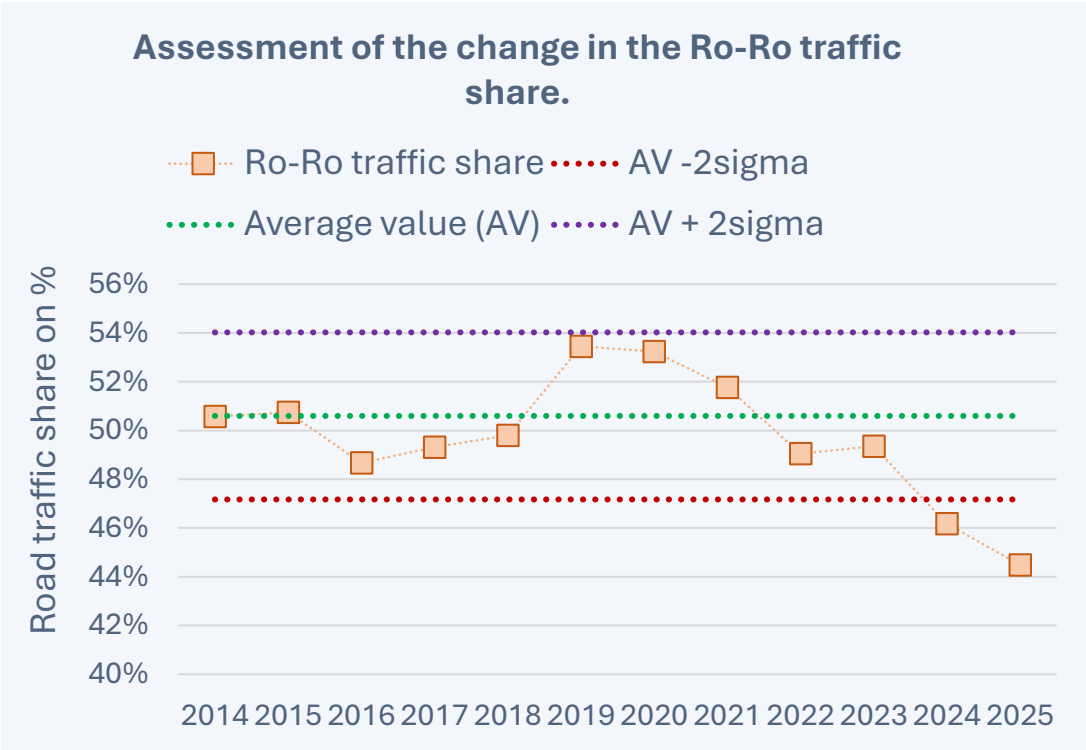
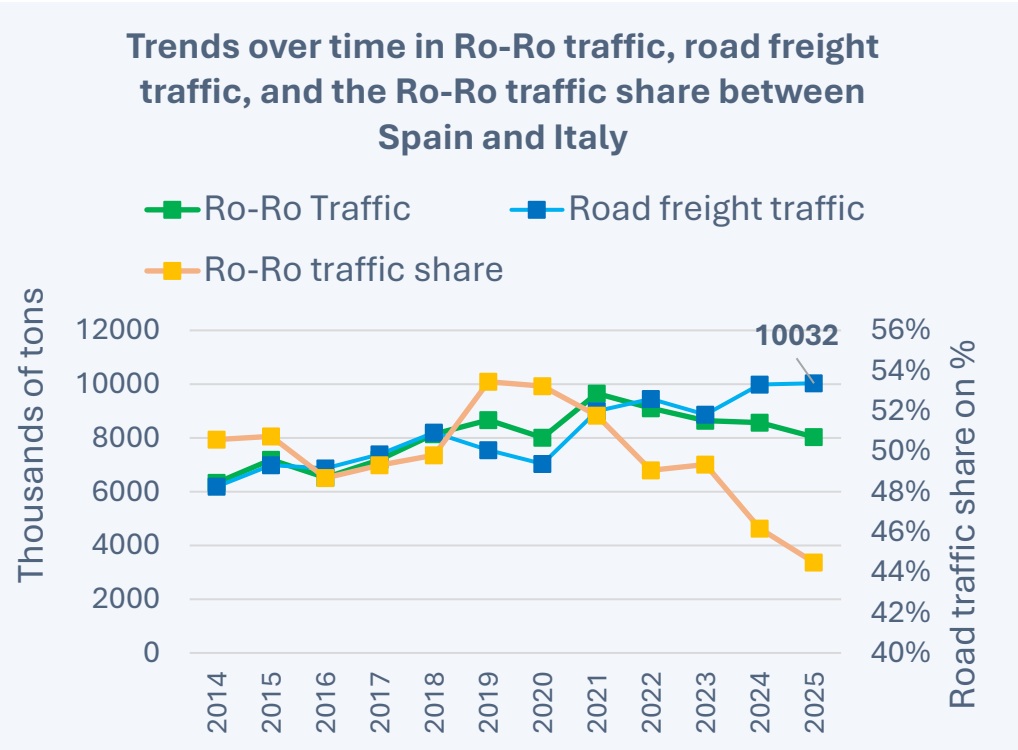
Variation over time of Ro-Ro traffic between Spain and Italy



The chart on the left illustrates the relationship between road freight traffic and gross domestic product (GDP). Based on this relationship, a linear regression model has been fitted, yielding a coefficient of determination (R^2) of 0.80. Based on the resulting regression line, the volume of goods transported by road in 2025 is estimated to reach approximately 10.1 million tons, shown on the chart on the left.

Case Study IV: RoRo Traffic on the Spain - Italy Corridor

Variation over time of Ro-Ro traffic between Spain and Italy



Based on the two estimates of road freight traffic for 2025, an average value of 10 million tons is obtained. This figure, in turn, supports an estimated ro-ro traffic share of 44.5% for that year. The observed ro-ro traffic share in 2024 and the estimated value for 2025 indicates a significant decline for this indicator, whose reduction exceeds the threshold equivalent to two standard deviations, making it unlikely that the observed decrease is attributable solely to random fluctuation. ***It is therefore highly possible that the reduction in the ro-ro traffic share may be attributable to the application of the EU ETS to maritime transport.***

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Prediction Service

Introduction

The objective of the prediction service is to **analyse and anticipate the effects of including maritime transport in the EU Emissions Trading System (EU ETS) on shipping routes and Spanish ports**, providing strategic information to support decision-making. Currently, the service has been implemented in the four main Spanish ports (Barcelona, Valencia, Algeciras, and Las Palmas), at risk in Northern Europe (Antwerp, Rotterdam, Hamburg, Bremerhaven and Le Havre) and in the East Med (Piraeus and Marsaxlokk). In the coming months, it will be extended to all European ports at risk due to the EU ETS implementation. The results presented here correspond to a second iteration, meaning that findings may be updated in future releases as more data and scenarios are incorporated.

Service Components

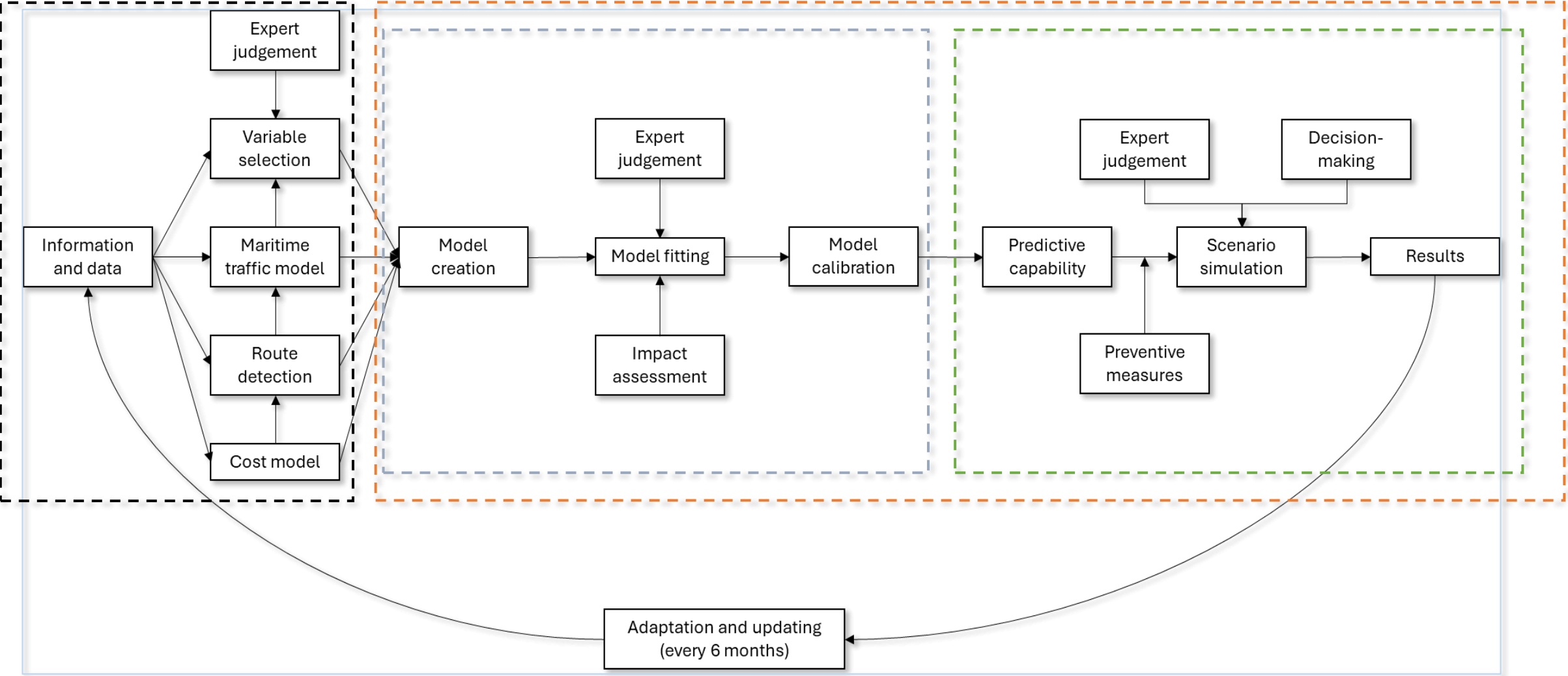
1. **Cost Model:** calculates route costs (CAPEX and OPEX).
2. **Econometric and Predictive Model:** analyze shipping company decisions and predict impacts on ports.
3. **Scenario Simulation:** evaluate the effect of parameter changes and conduct sensitivity analysis.

Work Stages

1. **Stage 1:** Information gathering and data structuring.
2. **Stage 2:** Modelling methodology.
3. **Stage 2.1:** Modelling.
4. **Stage 2.2:** Predictive application and scenario analysis.

Prediction Service

Work Stages



Prediction Service

Methodology

Why

- To evaluate the impacts of the EU ETS on shipping routes and Spanish ports, a **structured methodology** was implemented combining economic assessment, predictive modelling, and scenario simulation.
- This approach allows for a **quantitative evaluation of the economic implications** of potential route reconfigurations, while providing insights into how shipping companies make decisions under regulatory changes. At the same time, it anticipates **the effects on ports at risk** and on overall maritime traffic distribution. Finally, it enables the testing of **different “what-if”** scenarios to support informed strategic decision-making.

How

- **Understand the regulatory and economic implications** of the EU ETS on shipping companies and port activity.
- **Develop a robust predictive model** combining economic, technical, and traffic data with expert judgment to evaluate different scenarios.
- **Identify vulnerable ports** and anticipate potential shipping traffic reconfigurations.
- **Support strategic decision-making** for public authorities and private operators.
- **Establish a dynamic, updatable tool** capable of periodically adjusting predictions in response to new data or regulatory changes.

Prediction Service

Cost Model

The cost model evaluates the main expenses in maritime routes, including fuel, capital, operations, emissions, port fees, and crew costs.

Main Costs

- Navigation Costs: capital costs (CAPEX), and operating costs (OPEX).
- Fuel cost.
- Emission Costs (EU-ETS).
- Operational Costs.
- Port Fees.
- Crew Costs.

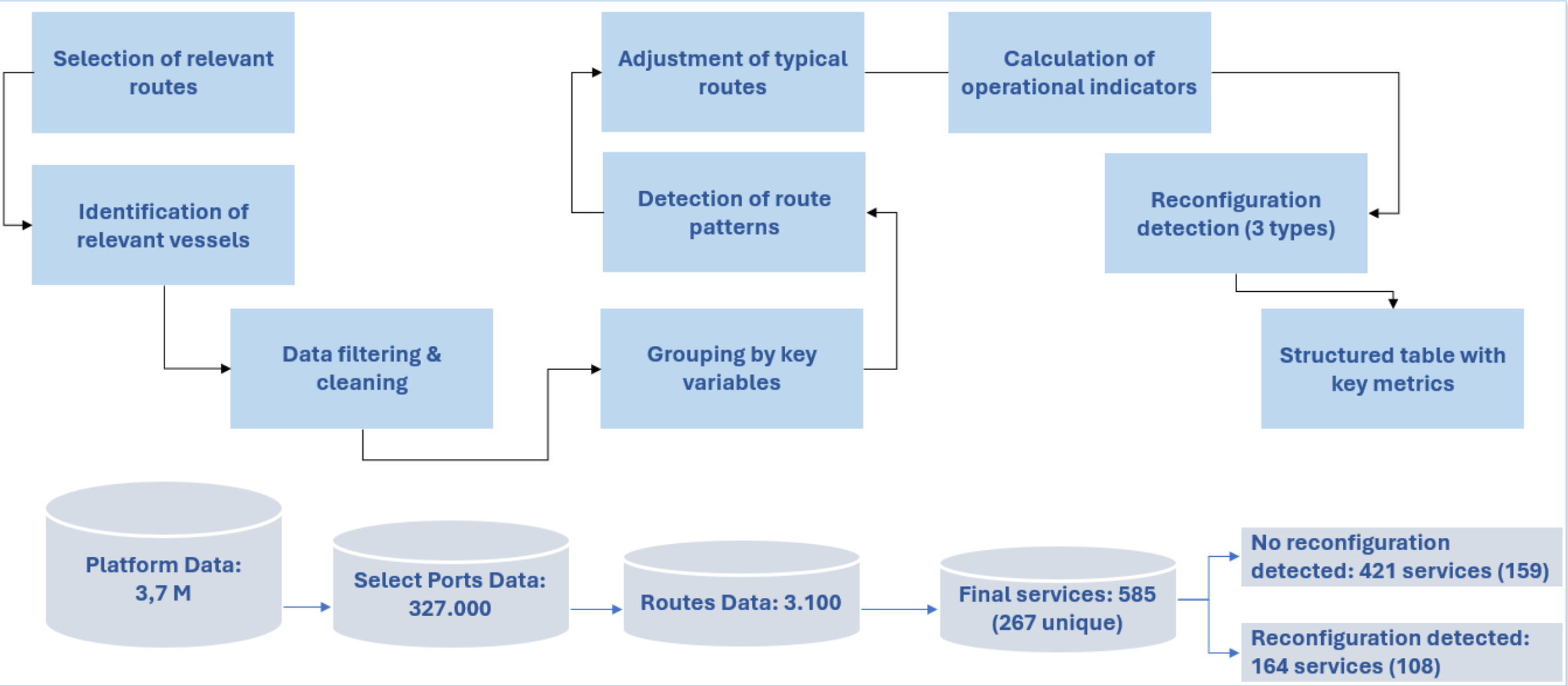
Cost Analysis Methodology

- Calculate each cost component separately for each route.
- Select the cost components that may significantly differ under route reconfiguration.
- Key differential cost components: Fuel Costs, Emissions Costs & Port Fees.

Indicator	Formula	Values		
Fuel Costs	$CFUEL = \frac{price_{fuel} \times emissions}{emission_{factor}}$	$price_{fuel}: \frac{0.45 \text{ €}}{kg}$	$emission_{factor}: 3.114 \frac{kgCO_2}{kg_{fuel}}$	
Emissions Costs	$CETS = ETS_{emissions} \times price_{emissions} \times f_{t,ETS}$	$price_{emissions} = 80 \text{ €/t}$	$t \in \{2023, 2024, 2025\}$	$f_{t,ETS} \in \{0, 0.4, 0.7\}$
Port Fees	$CTAX = N_{ports} \times price_{port}$	$price_{port} = 60,000 \text{ €}$		

Prediction Service

Route reconfiguration detection



Prediction Service

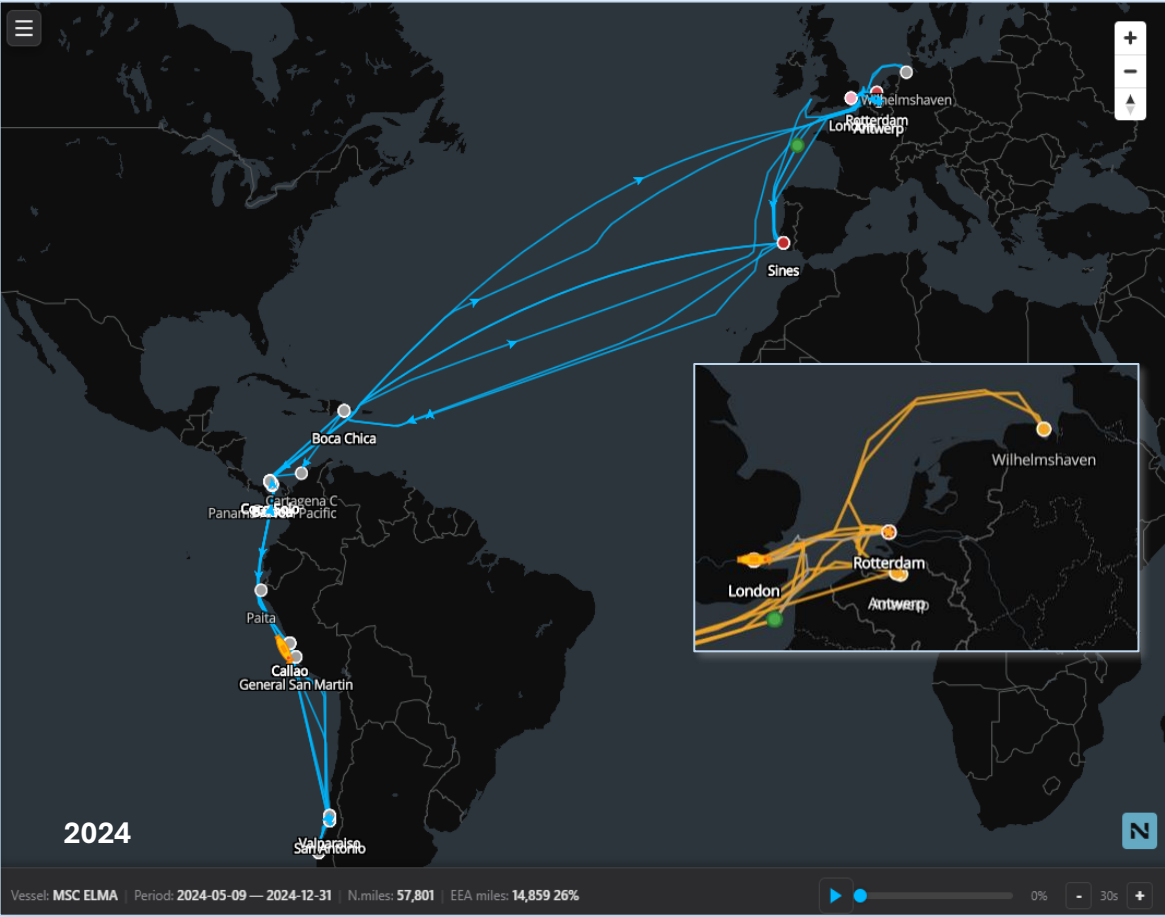
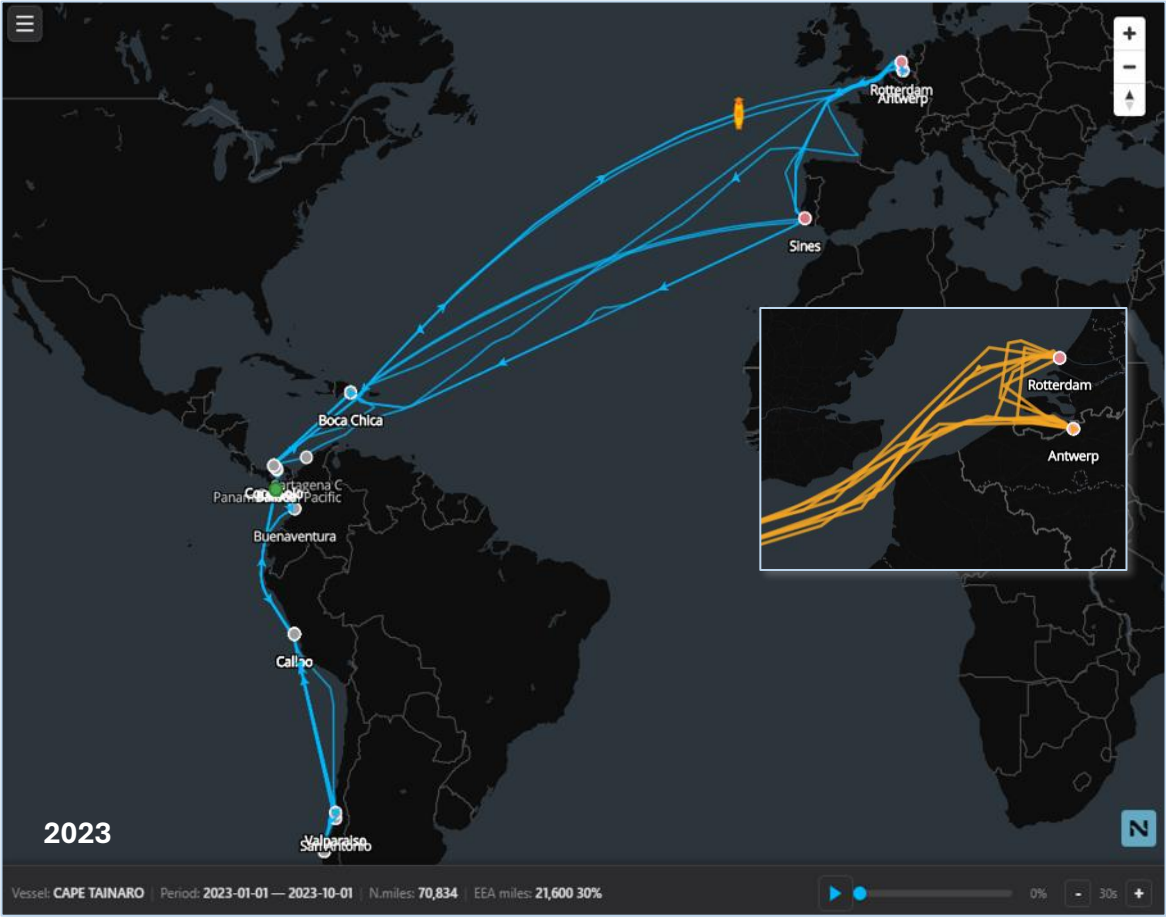
Route reconfiguration detection

Type	Description	Example
Port addition or removal	The same route is compared between the current year and the previous year to see if any high-risk ports, or any ports in north-west Africa or the United Kingdom, have been lost or added .	External Link External Link
Suez or Cape of Good Hope	The same route is compared between the current year and the previous year, and the route is analysed to determine whether the total distance of the route has increased by more than 4,000 nm , or whether the route has changed from passing through the Suez Canal to the Cape of Good Hope .	External Link External Link
Change in port order	The same route is compared between the current year and the previous year, and an analysis is carried out to determine whether the distance between the first European port and the previous one, or between the last European port and the next one , differs by more than 500 nm ; if so, this indicates that the sequence of ports has changed.	External Link External Link

Prediction Service

Route reconfiguration detection

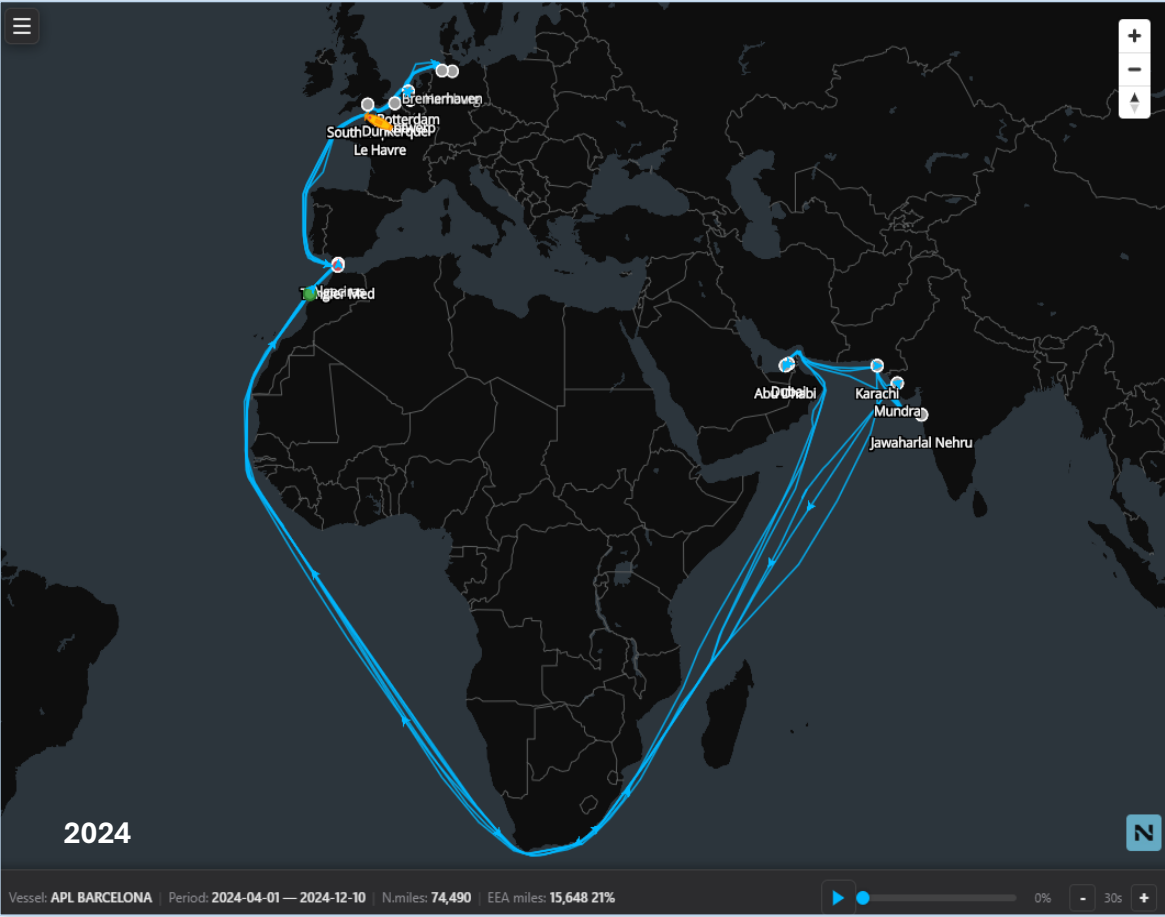
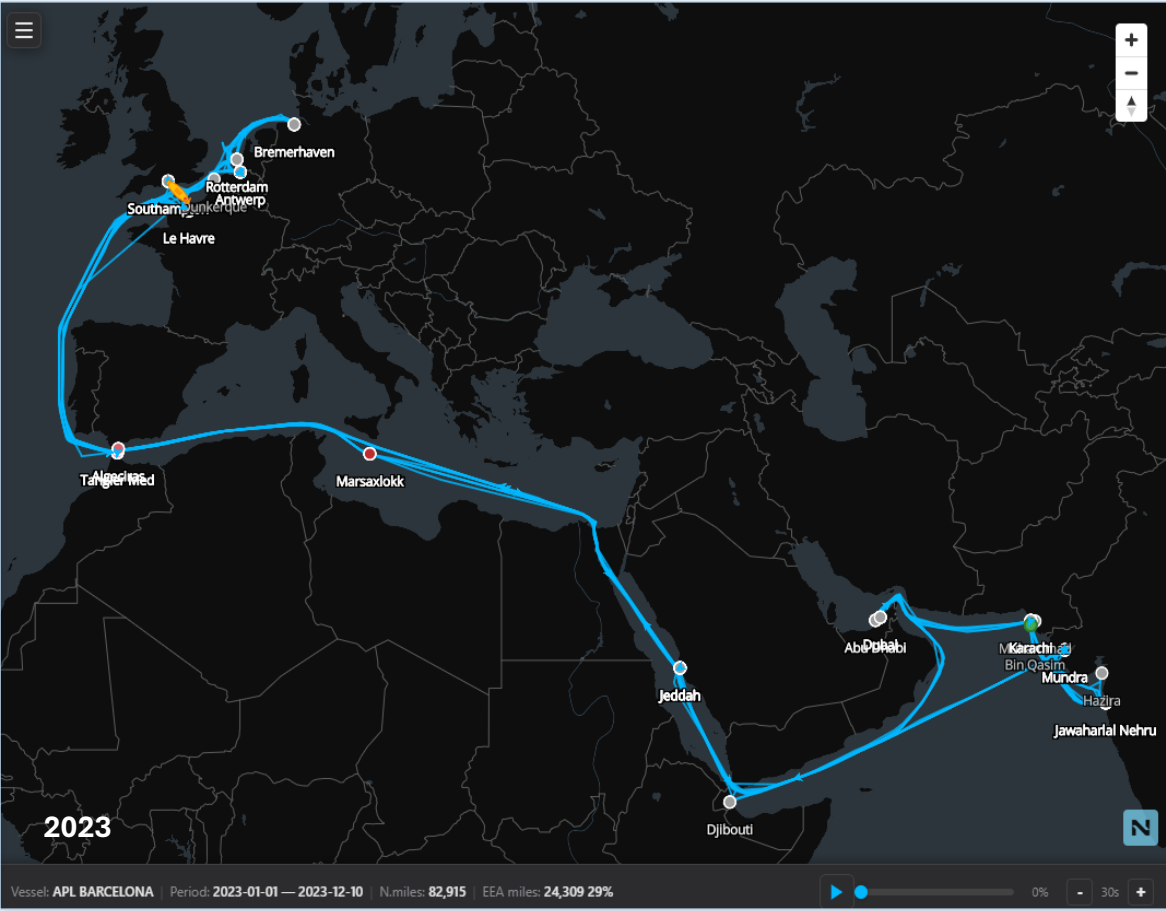
Example of a route reconfiguration. Port Addition or Removal. 2023 vs 2024



Prediction Service

Route reconfiguration detection

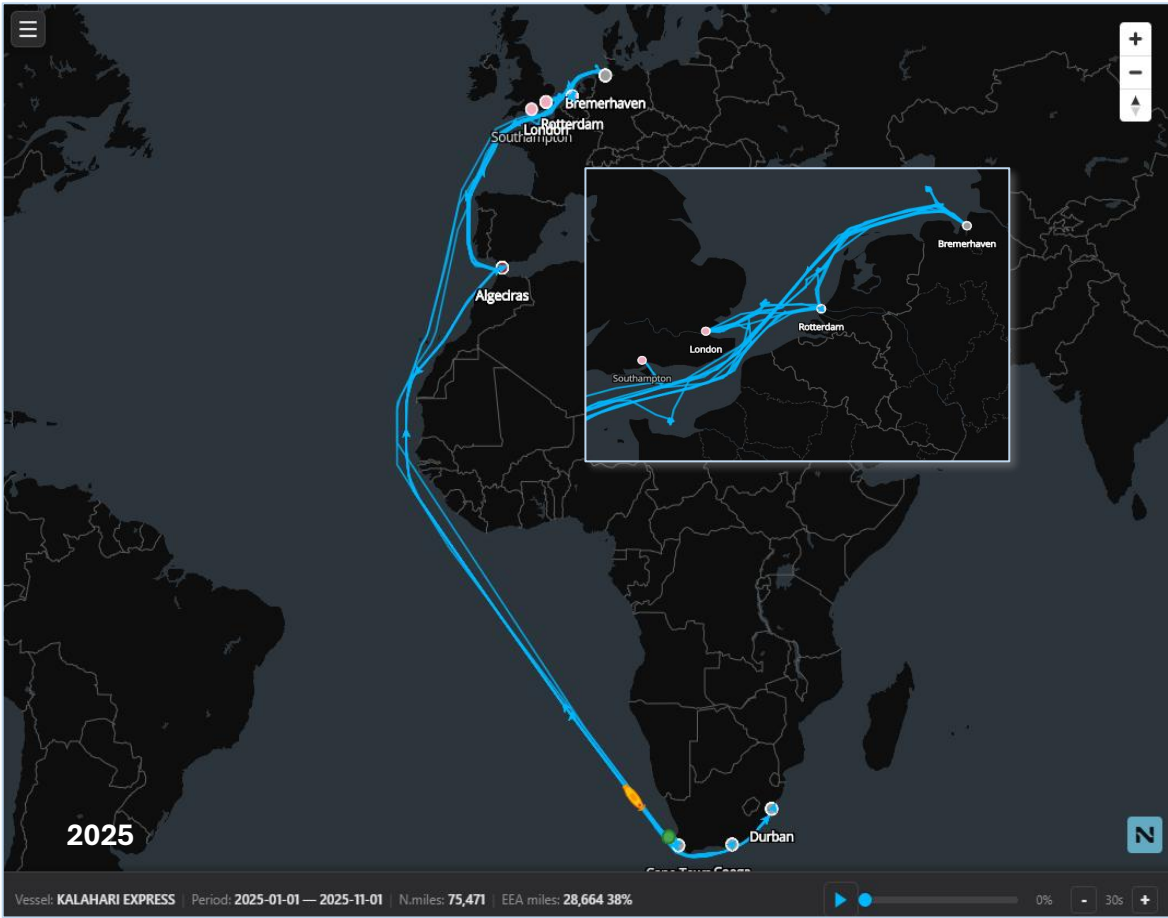
Example of a route reconfiguration. Suez or Cape of Good Hope. 2023 vs 2024



Prediction Service

Route reconfiguration detection

Example of a route reconfiguration. Change in port order. 2024 vs 2025



Prediction Service

Econometric and Predictive Model

Logistic Regression Model (logit)

To predict the probability that a shipping line will **change or not change** a maritime route:

$$\text{logit}(P) = \ln\left(\frac{P}{1-P}\right) = \beta_0 + \beta_1 \cdot X_1 + \beta_2 \cdot X_2 + \dots + \beta_k \cdot X_k$$

$$\text{Probability (route change)} = \frac{1}{1 + e^{-(\beta_0 + \beta_1 \cdot X_1 + \beta_2 \cdot X_2 + \dots + \beta_k \cdot X_k)}}$$

Numeric variables considered in the model

- **CFUEL:** fuel cost for a service.
- **CETS:** EU-ETS emissions cost for a service
- **CTAX:** cost of port tax for a service
- **Category:** ship type (select Post Panamax, New Panamax, ULCV)
- **Total Services:** 250 (116 unique) – 0 (148) / 1 (102)
- **Evaluation of alternative routes:** If the decision is made to change the route, the model will calculate the probabilities of choosing different alternative routes, enabling an informed assessment.

Prediction Service

Logistic Regression Results

Model

$$\text{logit}(P) = \ln\left(\frac{P}{1-P}\right) = \beta_0 + \beta_1 \cdot CFUEL + \beta_2 \cdot CETS$$

where:

CFUEL = Fuel cost for a service (€).
CETS = EU-ETS emissions cost for a service (€).

Main findings

- Both variables are statistically significant ($p < 0.01$).
- CTAX is not statistically significant ($p > 0.01$). Under the current assumptions (a uniform fee of 60,000€ assigned to all ports), it does not provide additional explanatory power for route reconfiguration.
- CETS is the dominant explanatory variable, representing 76% of the model's relative importance.
- Fuel costs also contribute, although with a smaller influence (24%).
- Higher regulatory and operational costs are associated with a greater probability of route reconfiguration.

Variable	Coefficient (β_i)	OR = e^{β_i}	P-value	Relative importance*
Intercept	-3,615	0,0269217	<0,001	-
CFUEL	0,0000007425	1,000001	0,0018	24%
CETS	0,00001494	1,000015	<0,001	76%

*Relative importance was calculated from the standardized logistic regression coefficients, allowing direct comparison between variables measured on different scales

Prediction Service

Model Predictive Performance

Objective

Evaluate the ability of the logistic regression model to correctly identify route reconfigurations.

Sensitivity

$$\text{Sensitivity} = \frac{TP}{TP + FN} = \frac{\text{Correctly Predicted}}{\text{Actual Reconfigurations}}$$

where:

TP = True Positives (i.e., correctly predicted route reconfigurations).

FN = False Negatives (i.e., missed route reconfigurations).

Threshold Sensitivity Analysis

- Probability threshold: 0.5
- Sensitivity: 77%
- When the **model gives a probability greater than 0.5**, there is a **risk of reconfiguration**. In this case, **the model correctly identifies 77 % of the current reconfigured routes**.

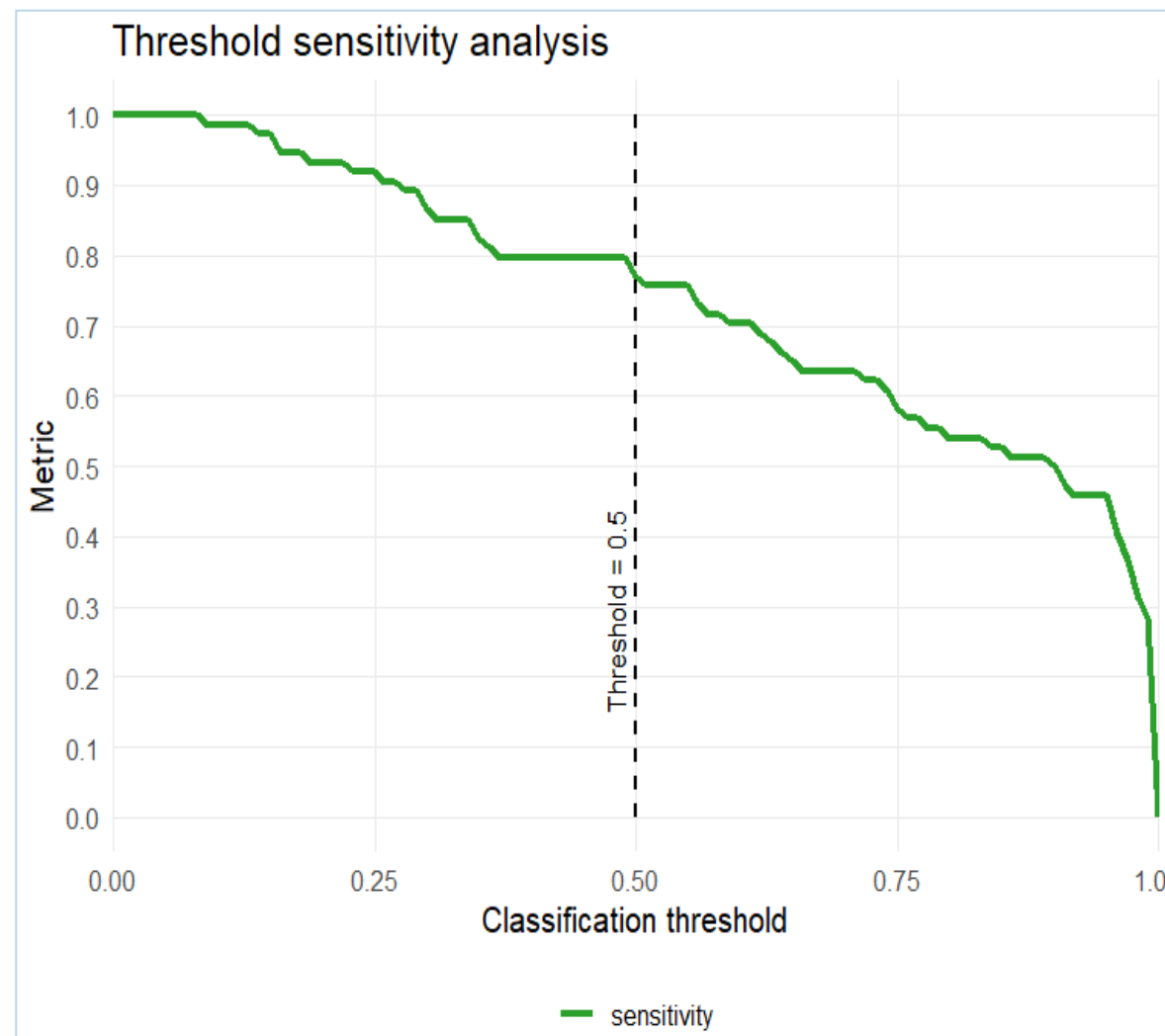


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Measures

Measure 1 — Extension of the criteria for the designation of “neighbouring container transshipment ports”.

This measure aims to prevent route transformation by broadening the criteria used to designate “neighbouring container transshipment ports”.

The current designation is based on the level of transshipment activity at neighbouring ports. However, this definition is not fully effective, as there are neighbouring ports with infrastructure suitable for calls by large container vessels which nevertheless display a low transshipment ratio. Moreover, the parameter relating to the level of transshipment is not always available and cannot always be reliably estimated on the basis of information reported under the MRV system or in port call manifests.

It is therefore proposed to introduce the possibility of designating a port as a “neighbouring container transshipment port” on the basis of its level of connectivity, measured in TEU-miles.

Measure 2 — Carbon leakage factor for deep-sea routes at splitting risk

This measure aims to prevent route splitting, that is, the segmentation of direct long-haul maritime services calling at EU ports into services structured around transshipment hubs located outside the EU. These services would consist of deep-sea routes operated outside the scope of the Union framework, complemented by feeder services connecting those hubs with EU ports.

The measure is based on applying a discount to the percentage of CO₂ emissions that must be covered through the surrender of emission allowances. This discount takes the form of a reduction factor (**Carbon Leakage Factor**) applied to the percentage of emissions to be reported by vessels operating on deep-sea routes. The reduction in the volume of CO₂ subject to the purchase of emission allowances is proportional to the savings that would be achieved by splitting the route on which those vessels operate.

Measure 1. Designation of “neighbouring container transshipment ports”

Methodology

It is proposed to broaden the criterion for classifying a port as a “neighboring container transshipment port”, in accordance with the following process:

1. Identify **ports** with the infrastructure and equipment **capable of handling vessels** with a capacity of more than **10,000 TEUs**. This classification may be based either on infrastructure characteristics—such as draught, quay length, and crane outreach—or on port activity data.
2. Calculate the next parameters:
 - **kTEU_miles Total:** For each port call, it is computed as the vessel's capacity in thousands of TEU multiplied by the half-sum of the inbound and outbound leg distances.
 - **kTEU_miles Deep Sea:** kTEU_miles calculated only for container ships operating on deep-sea routes, defined as those whose inbound or outbound voyage from the port exceeds 3,000 nautical miles.
 - **Deep Sea Ratio (DS%)** = $\Sigma \text{kTM Deep Sea} / \Sigma \text{kTM Total}$
3. Classify as “neighboring container transshipment ports” those ports that meet the following two conditions:
 - They have infrastructure and equipment **capable of handling vessels** with a capacity of more than **10,000 TEU**.
 - The **Deep Sea Ratio (DS%)** is equal to, or exceeds, **60%** over the two-year review period.

Measure 1. Designation of “neighbouring container transhipment ports”

Designation of "neighboring container transhipment ports" based on Kteu_miles

Port	Country	KTM DS 24+25	kTM 24+25	DS Ratio	Esc DS	Esc Total	% Esc DS
Felixstowe	UK	38.705.115	44.810.526	86,4%	602	1.816	33,1%
Ashdod	Israel	15.629.198	18.706.535	83,5%	272	2.685	10,1%
Damietta	Egypt	16.538.083	20.122.877	82,2%	444	1.989	22,3%
Tangier Med	Morocco	116.247.900	141.987.301	81,9%	2.956	7.592	38,9%
Southampton	UK	19.612.015	24.132.835	81,3%	765	1.696	45,1%
Abu Qir	Egypt	5.181.125	6.710.379	77,2%	79	544	14,5%
Port Said	Egypt	29.414.853	39.900.654	73,7%	520	3.558	14,6%
London	UK	21.402.454	29.391.461	72,8%	628	2.367	26,5%
Ambarli	Turkey	4.856.489	9.229.934	52,6%	213	5.687	3,7%
Tekirdag	Turkey	2.784.652	5.307.358	52,5%	121	2.021	6,0%
Alexandria	Egypt	3.259.035	7.318.389	44,5%	220	2.918	7,5%
Derince	Turkey	1.405.887	4.751.200	29,6%	102	2.005	5,1%
Mersin	Turkey	1.862.790	6.451.616	28,9%	167	2.852	5,9%
Aliaga	Turkey	2.258.674	8.254.186	27,4%	301	4.106	7,3%
Ain El Mraisse _El Manara	Lebanon	439.867	2.148.079	20,5%	21	1.770	1,2%

Choice of 60% threshold on transport work

Observed DS ratios show a clear rupture between ports below 72% and above 52%. A similar pattern emerges in the Suez-operative simulation in next slide.

KTM DS 24+25: deep-sea thousand TEU·miles, 2024+2025

KTM 24+25: total thousand TEU·miles, 2024+2025

DS Ratio: kTM DS / kTM (total)

Esc DS: deep-sea port calls

Esc Total: total port calls

% Esc DS: Esc DS / Esc Total

Measure 1. Designation of “neighbouring container transshipment ports”

Designation of "neighboring container transshipment ports" based on Kteu_miles. Simulation via Suez (year 2025)

Port	Country	kTM DS Cape	kTM Tot Cape	DS% Cape	kTM DS Suez	kTM Tot Suez	DS% Suez
Felixstowe	UK	22.614.563	25.399.003	89,0%	17.167.709	19.968.673	86,0%
Southampton	UK	13.932.496	16.259.658	85,7%	11.913.274	14.326.060	83,2%
Damietta	Egypt	8.401.481	9.914.732	84,7%	6.318.678	7.766.839	81,4%
Tangier Med	Morocco	57.322.675	69.794.556	82,1%	39.677.334	52.270.055	75,9%
Ashdod	Israel	8.744.694	10.247.502	85,3%	4.361.241	5.819.218	74,9%
London	UK	13.578.546	17.997.046	75,4%	12.069.957	16.300.785	74,0%
Abu Qir	Egypt	3.581.789	4.627.917	77,4%	1.923.382	2.882.880	66,7%
Port Said	Egypt	15.600.816	21.318.911	73,2%	9.862.063	15.428.947	63,9%
Ambarli	Turkey	2.304.257	4.776.681	48,2%	2.013.135	4.320.462	46,6%
Tekirdag	Turkey	1.931.467	3.356.841	57,5%	1.162.365	2.540.583	45,8%
Alexandria	Egypt	1.506.850	3.710.287	40,6%	1.422.139	3.608.452	39,4%
Aliaga	Turkey	1.088.470	3.790.506	28,7%	840.162	3.665.054	22,9%
Mersin	Turkey	643.975	2.874.681	22,4%	596.746	2.771.283	21,5%
Ain El Mraisse _El Manara	Lebanon	209.930	1.069.755	19,6%	209.927	1.034.651	20,3%
Derince	Turkey	375.102	2.233.856	16,8%	290.312	2.094.883	13,9%

Counterfactual scenario: 2025 traffic re-simulated with the Suez Canal fully operational, holding each 2025 route’s origin and destination ports constant.

The proposed 60% threshold is robust to this network-level shift — it classifies the same ports set under either Red Sea regime.

kTM DS Cape: deep-sea thousand TEU·miles, Cape route

kTM Tot Cape: total thousand TEU·miles, Cape route

DS% Cape: kTM DS Cape / kTM Tot Cape

kTM DS Suez: deep-sea kTEU·miles, Suez-operative simulation

kTM Tot Suez: total kTEU·miles, Suez-operative simulation

DS% Suez: kTM DS Suez / kTM Tot Suez

Measure 1. Designation of “neighbouring container transshipment ports”

Simulation of the effect of the measure

Suez closed scenario

Port	Country	Calls	ETS CO ₂ (50%)	ETS Revenue Captured (€*)	ETS Current (€*)	Factor
Felixstowe	UK	922	1.417.366	113.389.240	7.856.283	14,4x
London	UK	1.146	1.339.952	107.196.160	10.726.062	10,0x
Southampton	UK	972	1.192.066	95.365.280	5.625.036	17,0x
Damietta	Egypt	977	263.904	21.112.320	4.019.652	5,3x
Abu Qir	Egypt	339	122.446	9.795.640	2.525.544	3,9x
Ashdod	Israel	1.286	104.815	8.385.200	5.981.011	1,4x
TOTAL		5.642	4.440.548	355.243.840	36.733.588	9,7x

Simulated Suez open scenario

Port	Country	Calls	ETS CO ₂ (50%)	ETS Revenue Captured (€*)	ETS Current (€*)	Factor
Felixstowe	UK	282	910.123	72.809.801	7.856.283	9,3x
London	UK	404	1.041.083	83.286.638	10.726.062	7,8x
Southampton	UK	553	990.253	79.220.224	5.625.036	14,1x
Damietta	Egypt	72	99.872	7.989.731	4.019.652	2,0x
Abu Qir	Egypt	58	67.095	5.367.543	2.525.544	2,1x
Ashdod	Israel	46	104.507	8.360.523	5.981.011	1,4x
TOTAL		1.415	3.212.933	257.034.460	36.733.588	7,0x

Calls: Deep sea ($\geq 3,000$ nm) port calls (2025)

ETS CO₂ (50%) : 50% of total CO₂ emissions leaked, brought under the ETS maritime,

ETS Revenue Captured (€*): ETS revenue recovered under transshipment port designation

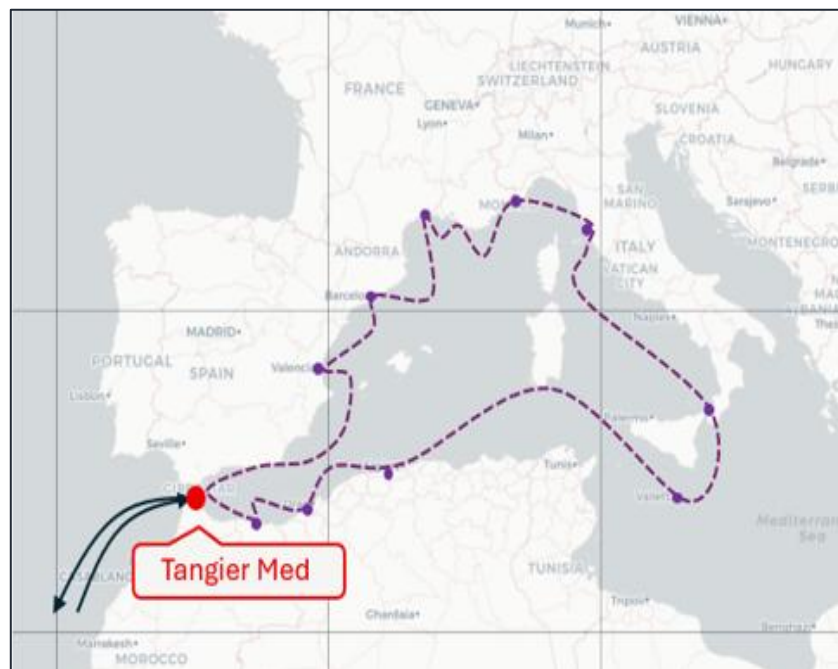
ETS Current (€*): ETS revenue under current rules

Factor: ETS Revenue captured / ETS Current

* Based on 80€/tCO₂

Measure 2: Carbon leakage factor for deep-sea routes

Fragmentation risk of direct maritime services



- Non-EU-HUB
- Feeder service
- Deep-sea service

The EU ETS creates an economic incentive to split direct transoceanic services to the EU into two separate services:

- **Deep-sea service:** Operated by vessels sailing on transoceanic routes between a neighbouring non-EU hub port and distant ports.
- **Feeder service:** Operated by vessels sailing on short-sea routes between a neighbouring non-EU hub port and EU ports.

The implementation of this avoidance strategy depends on the following factors:

D — ETS cost saved by service splitting

Annual EU ETS savings generated by the inbound and outbound voyages of the deep-sea route which is outside the scope of the EU ETS.

N — Cost of service splitting

Annual operating cost associated with splitting the direct service. This includes the cost of transshipment at a non-EU hub port, as well as the cost of an additional port call.

D/N — Carbon leakage risk ratio

When the D/N ratio is greater than 1, there is a risk that the route will be restructured. The level of risk is proportional to the **D/N carbon leakage risk ratio**.

Measure 2: Carbon leakage factor for deep-sea routes

Introduction to the approach

The measure: *To prevent direct container shipping services to the EU from being split in order to circumvent the EU ETS, it is proposed that a discount be applied to the percentage of CO₂ emissions that must be covered by the surrender of emission allowances. As not all services are exposed to the same level of risk, the discount would be calculated in proportion to that risk.*

- **Service-level framework:** The discount to be applied to a service in order to prevent its fragmentation is estimated using a simplified cost model of the service, which makes it possible to compare the savings resulting from splitting the service with the costs associated with such reorganisation.
- **Vessel-level framework:** However, the proposed discount cannot be implemented in practice at shipping-service level and must instead be applied at vessel level, for the following reasons:
 - The carbon footprint is not worked out at shipping-service level, but on a vessel-by-vessel and voyage-by-voyage basis.
 - Vessels are not generally assigned permanently to a single service.
 - The metric reported under the MRV system is not the economic cost, but CO₂ emissions.

Accordingly, it is proposed to establish a CO₂ emissions discount mechanism that can be applied at vessel level while producing an effect equivalent to that of the economic discount designed for shipping services.

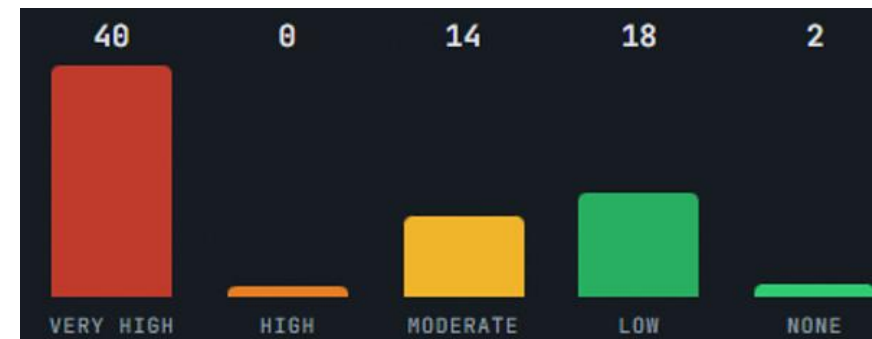
These discounts are determined by means of a factor, referred to as the **carbon leakage factor**, which depends exclusively on the distance sailed on each voyage performed by the vessel.

Measure 2: Carbon leakage factor for deep-sea routes

Service-level framework. The D/N carbon leakage risk ratio

Services are **grouped into** five risk levels. Only the top three ($D/N \geq 1.5$) qualify for a ETS discount:

- $D/N \geq 3.0$ — **very strong incentive** to restructuring
- $2.0 < D/N < 3.0$ — **strong incentive** to restructuring
- $1.5 < D/N < 2.0$ — **incentive** to restructuring. Cut-off threshold
- $1.0 < D/N < 1.5$ — **low incentive** to restructuring
- $0 < D/N < 1.0$ — **very low incentive** to restructuring



Number of maritime services in each of the risk levels listed on the left. There is a “gap” for values of k close to 2 due to the closure of the Suez Canal.

To reduce the risk of restructuring a maritime service, a **financial discount** ($F_Discount$) to the EU-ETS cost is applied so that **the carbon leakage risk ratio (D/N)** is reduced to the cut-off threshold of 1.5. Accordingly, the financial discount must satisfy the following condition:

$$\frac{\text{Route reorganisation savings} - F_Discount}{\text{Route reorganisation cost}} = \frac{D - F_Discount}{N} = 1.5$$

$$\text{or } F_Discount = \max(0, D - k \cdot N) \quad \text{where } k = 1.5$$

Measure 2: Carbon leakage factor for deep-sea routes

Vessel-level framework: The carbon leakage factor for deep-sea routes

Service-level framework: For each direct deep-sea service calling at EU ports, an economic discount is estimated with the aim of reducing the **carbon leakage risk ratio to 1.5**. This estimate is based on representative values for vessel operating costs and port-related costs.

Vessel-level framework: A Reduction Factor is applied to the emissions associated with each voyage performed by vessels deployed on deep-sea services calling at EU ports, with the aim of reducing the amount of CO₂ emissions in respect of which emission allowances must be surrendered.

This Reduction Factor referred as **Carbon Leakage Factor** is adjusted and calibrated so as to meet the following conditions:

- on average, the aggregate discount resulting from the application of the Carbon Leakage Factor to all vessels deployed on a given service is equal to the F_Discount value calculated for that service using the cost-balancing methodology (service-level framework);
- it does not depend on the service or services on which each vessel is deployed;
- it can be calculated exclusively based on parameters available to verification bodies, namely voyage distance and vessel capacity.

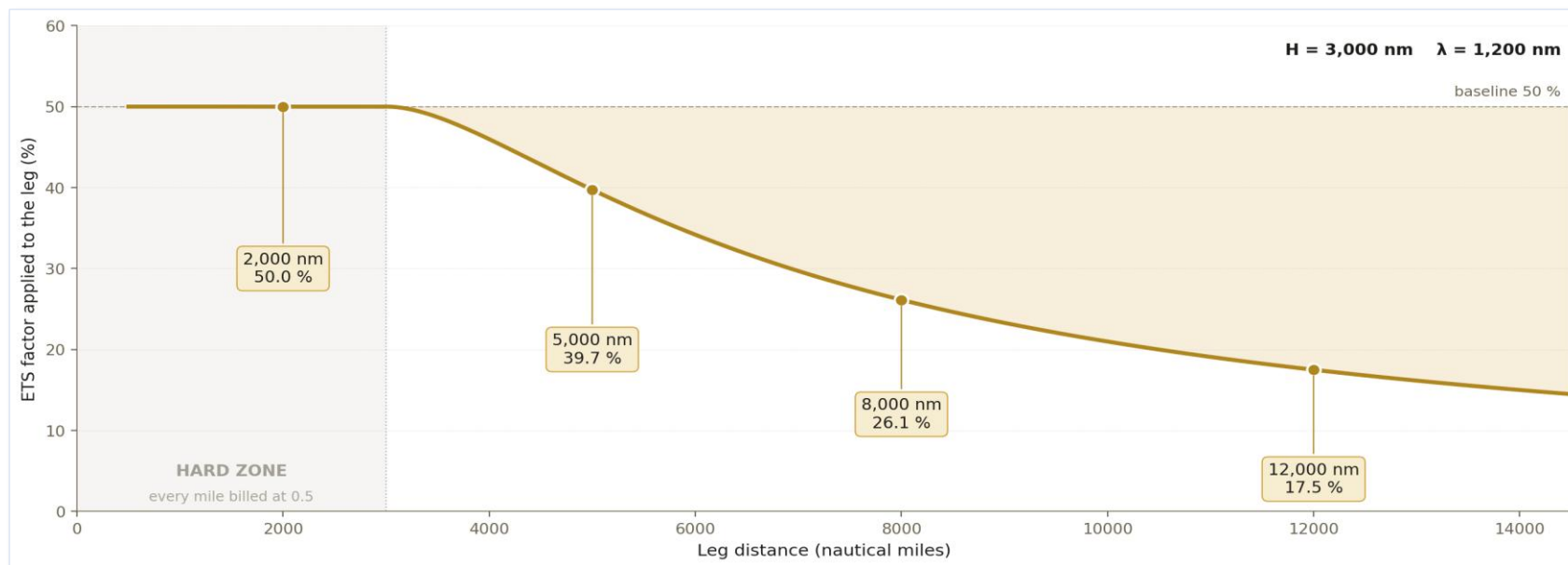
Measure 2: Carbon leakage factor for deep-sea routes

Vessel-level framework: The carbon leakage factor for deep-sea routes

The F_{Discount} value calculated for each direct deep-sea service using the cost-balancing methodology (service-level framework) can be replicated by applying a reduction factor to the emissions from each voyage performed by the vessels deployed on that service. This reduction factor, referred to as the **Carbon Leakage Factor**, is defined by the following expression:

$$\text{Carbon Leakage Factor } (L) = \frac{[0.5 \cdot \min(L, H) + 0.5 \cdot \lambda \cdot (1 - \exp(-m/\lambda))]}{L}, \quad m = \max(0, L - H)$$

The **Carbon Leakage Factor** determines the percentage of emissions from each voyage subject to surrender emission allowances.



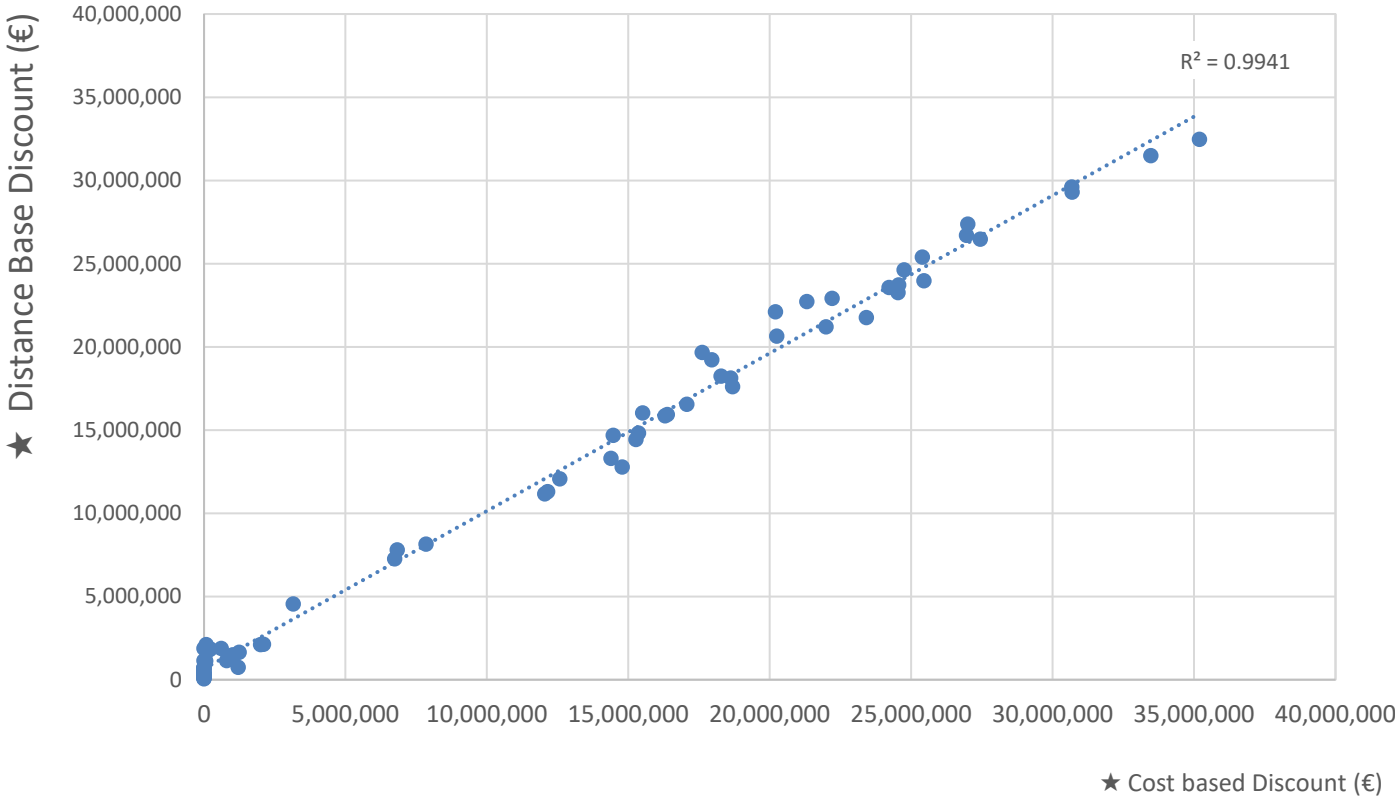
- L = Leg distance in nautical miles
- $H = 3,000$ nm - Below this distance every mile computed at the current 0.5 factor (short legs are not bonified)
- $\lambda = 1,200$ nm - Decay scale. Each additional λ miles cuts the excess factor by ≈ 2.72 (long legs converge to near 15%)

Measure 2: Carbon leakage factor for deep-sea routes

Service-level framework vs Vessel-level framework:

The following chart illustrates the relationship between the economic discount (**F_discount**) that would be applied to a maritime service under the cost-balancing methodology (service-level framework) and the discount achieved by applying the **Carbon Leakage Factor** (vessel-level framework) to the vessels operating within that service.

Method correlation by service



As can be seen, both methods produce very similar financial discounts. With the coefficient of determination of the regression line between the two methods being equal to $R^2 = 0,99$.

Therefore, applying the Carbon Leakage Factor to the emissions reported by vessels operating on transoceanic routes makes it possible to grant a financial discount to maritime services exposed to the risk of route splitting, ***without having to identify each service individually or analyse, in detail, the balance between the benefits of route reconfiguration and the costs associated with splitting each service.***

Measure 2: Carbon leakage factor for deep-sea routes

Service-level framework vs Vessel-level framework: Simulating the effect of the measure.

Overall effect of applying this measure: conceptual framework -> **blue square**; operational framework -> **green square**)

Suez closed scenario

Corridors via CAPE	ETS in/out (D)	F_Discount	Discount %	effective ETS%	Operational Discount	Discount %	effective ETS%
Europe-Asia	1.036 M€	657 M€	63,4%	18,3%	646 M€	62,4%	18,8%
Europe-Middle East & India	157 M€	90 M€	57,3%	21,3%	84 M€	53,3%	23,3%
Europe-Americas	250 M€	6 M€	2,5%	48,8%	26 M€	10,4%	44,8%
Europe-Africa	36 M€	5 M€	14,6%	42,7%	7 M€	19,3%	40,4%
Other	60 M€	37 M€	61,7%	19,2%	36 M€	59,0%	20,5%
TOTAL	1.539 M€	795 M€	51,7%	24,2%	798 M€	51,9%	24,1%

Suez open scenario

Corridors via SUEZ	ETS in/out (D)	F_Discount	Discount %	effective ETS%	Operational Discount	Discount %	effective ETS%
Europe-Asia	622 M€	242 M€	38,9%	30,6%	238 M€	38,2%	30,9%
Europe-Middle East & India	60 M€	5 M€	8,0%	46,0%	3 M€	4,2%	47,9%
Europe-Americas	250 M€	6 M€	2,5%	48,8%	26 M€	10,4%	44,8%
Europe-Africa	36 M€	5 M€	14,6%	42,7%	7 M€	19,3%	40,4%
Other	37 M€	14 M€	36,9%	31,5%	13 M€	35,1%	32,4%
TOTAL	1.004 M€	272 M€	27,0%	36,5%	286 M€	28,5%	35,8%

F_Discount (€): ETS revenue forgone — corridor discount (left) / operational discount (right)
Effective ETS%: factor to multiply voyage CO2 tonnes to obtain tons subject to surrender allowances

ETS in/out (D): ETS cost for all incoming/outgoing legs
Discount %: Discount / D

Measure 2: Carbon leakage factor for deep-sea routes at rupture risk

Implementation

1. The Commission, by means of a delegated act, reviews and, where appropriate, adjusts the discount curves in line with cost developments—every two years—when significant differences in navigation costs arise. Such an adjustment will be particularly relevant when there are significant changes in the price of carbon emission allowances compared with the price of €75 per tone used to calibrate the proposed Carbon Leakage Factor for Deep-Sea routes.
2. These curves are used by the shipping company and would be assessed by an ETS MRV verifier to calculate ETS obligations as follows:

For each leg calling an EEA or neighbour transshipment port from a non-EEA port beyond 3.000 nm (or departing from an EEA or neighbour transshipment towards a non-EEA port beyond 3.000 nm) :

- Calculate the Carbon Leakage Factor derived applying the curve function to the distance with the curve formula:

$$\text{Carbon Leakage Factor } (L) = \frac{[0.5 \cdot \min(L, H) + 0.5 \cdot \lambda \cdot (1 - \exp(-m/\lambda))]}{L},$$

$$m = \max(0, L - H)$$

- Report carbon allowances for the total leg carbon emissions **multiplied** by the Carbon Leakage Factor

Measures

Conclusions (1/2)

- **Measure 1:** Implementing this measure would increase the amount of CO₂ and revenues under the EU-ETS scope as follows:

	Additional CO ₂ included in the EU-ETS (million tonnes)	Additional revenue (€ million)
Suez Canal closed	4,4	355
Suez Canal open	3,2	257

- **Measure 2:** Implementing this measure would reduce the volume of CO₂ emissions reported under the system and would therefore result in a loss of revenue. Nevertheless, it would help prevent avoidance strategies that could substantially reduce both the CO₂ emissions reported under the EU ETS and the revenues generated by the system over the medium term.

The estimated impact of this measure in terms of CO₂ emissions and revenues included in the system would be as follows:

	CO ₂ excluded from the EU-ETS (million tonnes)	Reduction in revenue (€ million)
Suez Canal closed	10,6	795
Suez Canal open	3,6	272

Therefore, the *cost of implementing Measure 2 under the Suez Canal open scenario would be very similar to the additional revenue generated by implementing Measure 1.*

Measure 2 not only helps to reduce the risk of route splitting but also contributes significantly to lowering the additional cost that the closure of the canal has introduced into the application of the EU ETS to maritime transport.

Complementarity of the Measures

- **Risks associated with measure 1**

Measure 1 helps reduce the likelihood that shipping companies will divert their routes in order to circumvent the application of the EU ETS. ***However, its implementation also increases the overall emissions-related costs borne by shipping companies. This increase in costs could strengthen the incentive to split direct deep-sea services.***

- **Complementarity between the two measures**

To mitigate this risk, ***Measure 1 should be implemented alongside Measure 2.***

The two measures should therefore be regarded as complementary. Measure 1 reduces the incentive to make evasive port calls at certain ports, although it may increase the risk of route fragmentation. Measure 2, in turn, helps reduce the likelihood of service reconfigurations or splitting.

- **Economic Balance**

Once maritime traffic through the Suez Canal has been restored, ***the cost associated with implementing Measure 2 would be similar to the additional revenue generated by Measure 1.***

Consequently, the combined implementation of both measures would reduce the risk of avoidance strategies being developed without causing a significant loss of revenue within the EU ETS.

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Findings and conclusions

- ❖ **Port level (Tier 1).** The market share of Europe's main gateway ports in long-haul TEU-miles declined from 67% (Q1 2023) to 57% (Q1 2026). The erosion affects the three regions.
 - *Northern Europe:* the UK more than doubled its TEU-mile share a gain almost symmetrical to the combined losses of the Netherlands and Germany.
 - *Eastern Mediterranean:* Piraeus fell from ~34% of gateway traffic to ~14%, while Egyptian ports became the region's dominant nodes.
 - *Western Mediterranean:* remains broadly stable (EU ~60% of deep-sea transport work), with movement confined to the transshipment margin (non-EU share 32%→37%, led by Tanger Med).
- ❖ **Network level (Tier 2, container tracking).** The tracking dataset distinguishes two mechanisms behind these shifts.
 - UK, deep-sea calls grew without any rise in transshipment (flat at ~13–14% of throughput) and without significant erosion of direct flows at EU, therefore route transformation, not route splitting.
 - In Eastern Mediterranean, by contrast, transshipment activity has genuinely relocated: non-EU hubs overtook EU ports in Q1 2025, closely following the start of Gemini operations.

- ❖ **Carrier level (Tier 3).** All major alliances are reinforcing non-ETS gateways.
 - *Northern Europe:* ONE-HMM-Yang Ming (Premier) raised its UK deep-sea share of North Europe TEU from 10% to 44%, centered on Southampton.
 - *Eastern Mediterranean:* Hapag-Lloyd moved from 27% of its East Med operations at Egyptian/Turkish ports in 2023 to nearly all by Q3 2025.
 - *Western Mediterranean:* Maersk's MECL service eliminated its European ETS exposure entirely (Algeciras → Tanger Med → direct).
- ❖ **Structural signal:** Total investment announced in the 2021–2030 terminal projects across the Euromed region commit €14.9 bn / 41.7 M TEU of new capacity. The split is asymmetric: €9.3 bn of all capital spend and 25.7 M TEU of new capacity lands on non-EU quays.

Therefore, 62% of all planned Euromed capacity growth falls outside EU ports, despite non-EU ports holding only ~30% of total import/export container activity..

Results and conclusions

Key indicator matrix

Region	ETS	kTEU-mile		Transshipment		Direct Connectivity		Capacity Investments		Conclusions
		Share	Growth	Share	Growth	Ratio	Delta	€m	m TEU	
North Europe	EU	66%	Δ +62%	93%	Δ +22%	84%	▽ -5 pp	1.924	6,3	UK ports show sustained growth in deep-sea calls, but without a comparable rise in transshipment.
	non-EU	34%	Δ +278%	7%	Δ +68%	89%	Δ +1 pp	1.500	2,8	
East Med	EU	31%	▽ -16%	43%	Δ +9%	46%	▽ -10 pp	948	2,7	EU ports have lost direct connectivity as deep-sea services connecting directly to their ports decline. Over the same period, non-EU ports have progressively gained transshipment activity that EU ports have failed to capture.
	non-EU	69%	Δ +124%	57%	Δ +55%	45%	Δ +5 pp	5.001	16,5	
West Med + Atlantic	EU	61%	Δ +75%	55%	Δ +19%	74%	Δ +12 pp	2,738	7,0	Most stable region. EU ports keep their transshipment volume, but their regional share is declining as relay connections between Asia-Europe services shift to neighbouring non-EU ports. Direct connectivity, however, has not deteriorated.
	non-EU	39%	Δ +65%	46%	Δ +38%	17%	Δ +3 pp	2,796	6,4	

Results and conclusions

- ❖ The **EU ETS imposes an additional cost that is most significant for transoceanic container services, placing operations at EU ports at a structural cost disadvantage relative to neighbouring non-EU ports.** This created a standing economic incentive for relocation — an incentive that remained latent while route reconfiguration costs were high and suitable infrastructure outside the EU was scarce.
- ❖ **The Red Sea crisis and the expiry of the CBER forced a wholesale redesign of shipping networks,** and the completion of major port projects in neighbouring countries removed the capacity constraint. **Networks rebuilt under these conditions were optimised against total operating cost — of which ETS exposure is now a material component.**
- ❖ The scale of **committed investment in non-EU port container ports capacity** indicates that **this reconfiguration is structural, not cyclical:** once services, terminals and contracts consolidate around non-EU hubs, the shift will be difficult to reverse.
- ❖ The Spain–Italy case study found the **ro-ro share of corridor freight falling from 49.4% in 2023 to an estimated 44.5% in 2025,** a decline beyond two standard deviations that may be associated with the application of the EU ETS to maritime transport but not to road haulage.

❖ Main container research results:

- 1. Sustained losses in deep-sea connectivity at Eastern Mediterranean EU ports,** materializing mainly through route splitting, with a greater share of containers are received via feeder from non-EU ports, mainly Egypt.
 - 2. UK ports** have gained a significant share of deep-sea traffic mirrored by a combined loss of Rotterdam and German ports. This shift is not related to an increase of import/export or transshipment activity.
 - 3. Pure relay transshipment** traffic, where EU ports connect two remote regions, **has halved at the EU West Med hubs since 2023 (–51 %), while Tanger Med holds steady (+5 %).**
 - Overall, **European ports are losing a 5% share in the growing transshipment market (+25%)** in the Mediterranean region.
- ❖ **ETS identified as a main driver. A discrete choice model** has been developed to statistically assess the extent to which the additional costs generated by the EU ETS have influenced observed route reconfigurations. **76% of the route changes can be explained by the EU ETS cost .** Alternative explanations have been examined and found insufficient to justify the four abovementioned traffic transformation results

Mitigation Measures proposed

❖ **Measure 1 — extended designation of "neighbouring container transshipment ports"** — aimed at preventing route transformation.

- The current designation criterion, which is based on transshipment activity, does not capture neighbouring ports that are capable of accommodating large deep-sea vessels but have relatively low transshipment shares. Furthermore, transshipment volumes are difficult to verify using either MRV data or port-call information.
- The measure proposes that ports be designated as 'neighbouring container transshipment ports' where they meet both of the following conditions:
 - They have infrastructure and equipment capable of handling vessels with a capacity of more than 10,000 TEU.
 - The Deep-Sea Ratio (share of deep-sea kTEU·miles in the port's total transport work) is greater than 60% over the two-year review period.
- Applied today, the criterion would add six ports to the current list (three in the UK, two in Egypt, one in Israel), bringing an estimated 4.4 Mt of CO₂ and €355M of annual revenue into the system under the current Cape routing (3.2 Mt / €257M with Suez operational).

❖ **Measure 2 — a Carbon Leakage Factor for deep-sea routes** — aimed at preventing route splitting.

- It is proposed that a reduction factor, referred to as the Carbon Leakage Factor (CLF), be applied to the volume of emissions subjected to surrender of emissions allowances from each voyage undertaken by container vessels. The factor would vary according to the distance travelled during the voyage.

For each voyage: ***Emissions subject to the surrender of allowances = Total voyage emissions × CLF (distance travelled)***

- The **Carbon Leakage Factor** is intended to reduce the risk of container shipping routes being fragmented as a means of avoiding the costs associated with the EU ETS. Such a reconfiguration could result in goods reaching the EU ports indirectly, via non-EU HUB ports.
- The **Carbon Leakage Factor** has been designed and calibrated on the basis of an assessment of the costs and benefits associated with restructuring deep-sea shipping services. In practical terms, however, it would be applied separately to each vessel and voyage, using the distance travelled as the sole parameter.

❖ **The two measures are designed to operate jointly.** **Measure 1** alone raises the total ETS cost borne by carriers and could thereby strengthen the incentive to split services — the one strategy it cannot prevent; **Measure 2** removes that incentive. Under a restored Suez scenario, the revenue foregone by Measure 2 (€272M) is broadly offset by the additional revenue captured by Measure 1 (€257M): the combined package would materially reduce the risk of both avoidance strategies at approximately neutral net revenue for the system.

Prediction Service

Model parameter and relative importance

Variable	Coefficient β_i	OR = e^{β_i}	P-value	Relative importance *
Intercept	-3,615	0,0269217	<0,001	-
CFUEL	0,00000074 25	1,000001	0,0018	24%
CETS	0,00001494	1,000015	<0,001	76%

Second results and conclusion

- Preliminary logistic regression results indicate that **ETS-related costs (CETS)** are the **main driver of route reconfiguration**, accounting for **76% of the relative importance**, while **fuel costs (CFUEL)** explain the remaining **24%**. These findings suggest that regulatory costs currently have a stronger influence than operational fuel costs on route reconfiguration decisions.
- Route reconfiguration is **identified** by comparing each service with its configuration in the previous year and detecting **port additions/removals, changes in port sequence, and Suez–Cape of Good Hope route deviations**. This methodology provides an objective and reproducible framework for identifying changes in liner shipping networks.
- A **threshold sensitivity analysis** showed that, using a **probability threshold of 0.5**, the model correctly **identified 77% of the routes** that were actually reconfigured, demonstrating a good capability to **detect real network changes**.
- These **results** should **not be regarded as definitive**. As additional **services, updated operational data and new explanatory variables become available**, the model will be further **refined and validated**, providing a **more comprehensive assessment of the factors** driving route reconfiguration under the EU ETS framework.

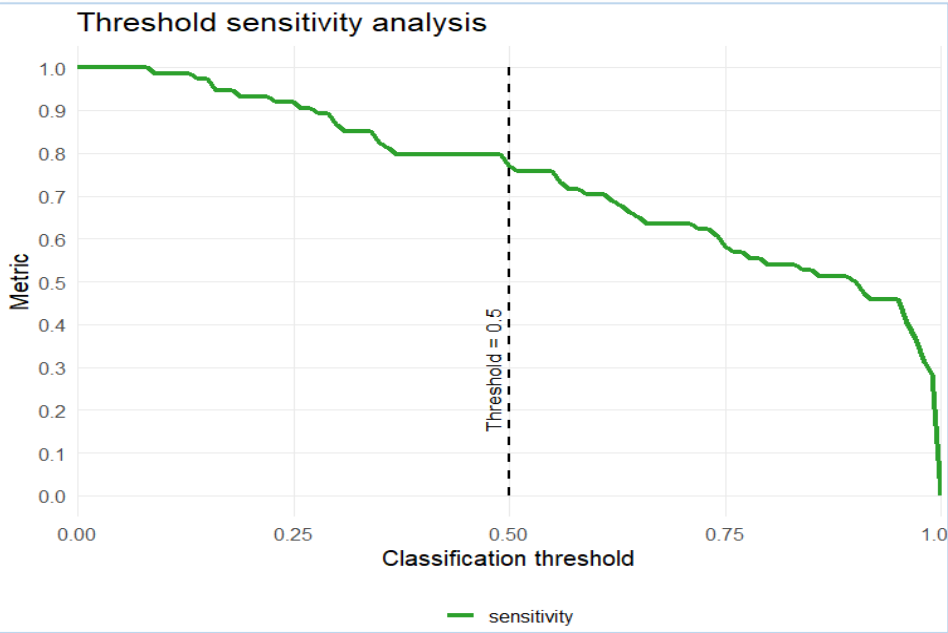


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Annex I. Evasion ratio

Cost of splitting a maritime service

To estimate the cost of splitting a deep-sea service, the first step is to identify the closest neighbouring hub port to the area served by the route. The original deep-sea route is then decomposed into a deep-sea route starting and ending at that hub, together with a feeder route — usually circular in nature — serving the same ports at the same frequency as the original service.



Deep-sea: Algeciras, Marsaxlokk, Livorno, Genova, Marseille-Fos, Barcelona, Valencia, Pointe-a-Pitre, Fort-de-France, Caucedo, Cartagena (Col), Kingston, Houston, VeraCruz, Manzanillo(Pan), Puerto Limon, Cartagena (Col), Algeciras (8 vessels)



Feeder: Tanger, Marsaxlokk, Livorno, Genova, Marseille-Fos, Barcelona, Valencia, Tanger (2 vessels)

Deep-sea: Tanger, Pointe-a-Pitre, Fort-de-France, Caucedo, Cartagena (Col), Kingston, Houston, VeraCruz, Manzanillo(Pan), Puerto Limon, Cartagena (Col), Tanger (6 vessels)

The reorganisation of the route is carried out while maintaining the same type and number of vessels as in the original route. This approach provides an upper-bound estimate of the cost, since, in an actual reorganisation, the shipping company may rely on existing feeder services to distribute the cargo, thereby reducing the costs associated with the reorganisation.

An example of the reorganisation of the CMA CGM / Marfret Med-Caribbean-NCSA-US Gulf joint service — MedCar route is shown on the left

Annex I. Evasion ratio

Cost of splitting a maritime service

Cost of splitting a maritime service

- $\text{Cost of splitting a maritime service} = \text{Port}_{\text{fees}} + \text{Cost}_{\text{handlings,transshipment}}$
- $\text{Cost}_{\text{(handlings, transshipment)}} = C_{\text{nonEU}} \cdot (1 - T) \cdot Q \cdot \text{TEUS} - (HC_{\text{EU}} - HC_{\text{nonEU}}) \cdot T \cdot Q \cdot \text{TEUS} = 5 \cdot \text{TEUS} \cdot Q$

Where:

- C_{nonEU} : Handling cost in non-European port
- HC_{EU} : Handling cost in European port
- T : % of cargo from European transshipment to non-European port transshipment
- $(1-T)$: % of cargo from European Import/Export to African Transshipment
- Q : % of the vessel's capacity used (occupancy)
- TEUS : maximum capacity of the vessel

Annex I. Evasion ratio

Cost of splitting a maritime service

Variable		Assigned average value
Carbon price (€/tCO₂)		75
Q	%of the vessel's capacity used	0.9 (90%)
T	From European transshipment to African Transshipment	0.4 (40%)
1-T	From European Import/Export to African Transshipment	0.6 (60%)
HC_{EU}	Handling cost EU (€/TEU)	100
HC_{nonEU}	Handling cost Africa (€/TEU)	45
$Port_{fees}$	Port call cost (€)	60000

Assumptions on cargo volumes: It is assumed that vessels do not operate at full capacity, but at $Q=90\%$ of their nominal capacity.

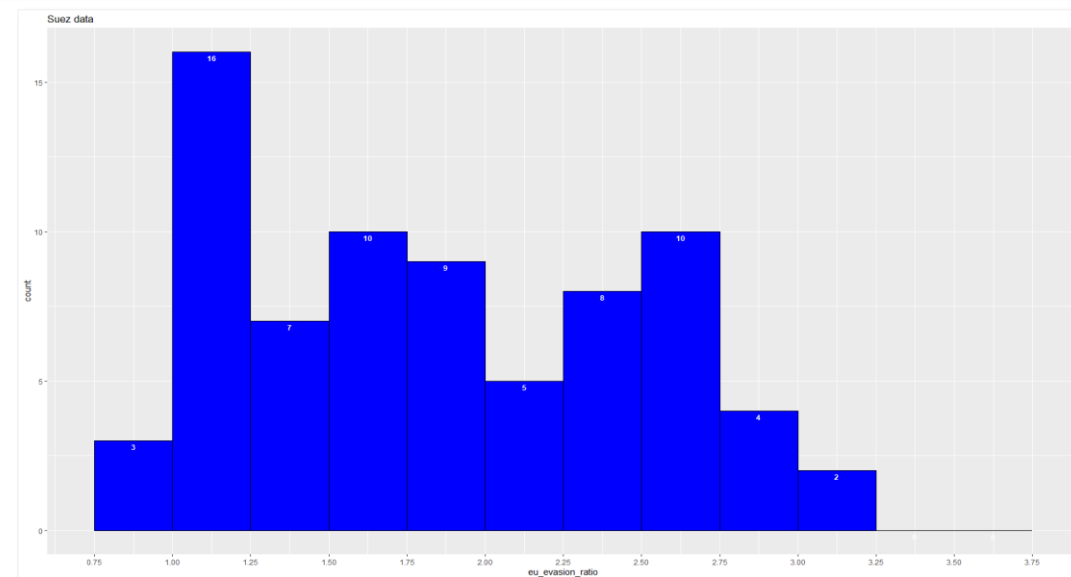
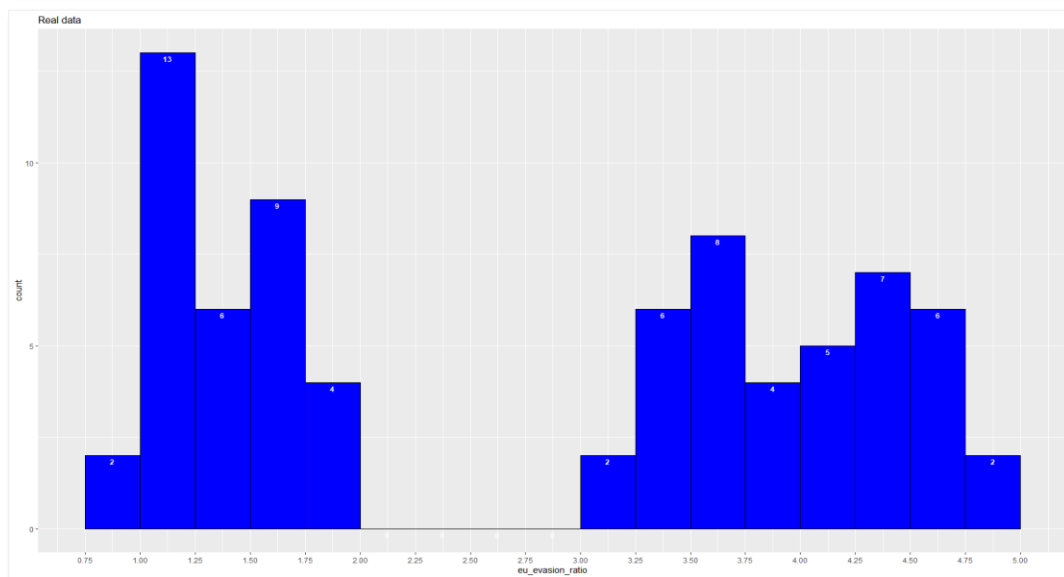
It is further assumed that only part of the cargo, corresponding to $(1-T)=60\%$, has its origin or destination in ports located within the area served by the EU hub port.

The remaining share of cargo, $T=40\%$, is assumed to be intended for transshipment to other regions. Such transshipment may take place either at the EU hub port or at an alternative hub port located in a neighbouring third country.

Annex I. Evasion ratio

Effect of the Suez Canal closure

The charts below are histograms showing the number of maritime container services as a function of the evasion ratio. To construct these histograms, all container shipping routes covering distances above 3,000 nautical miles were identified, resulting in a sample of 76 transoceanic routes. The chart on the left reflects the behaviour of actual routes, where Asia–Europe connections are operated via the Cape of Good Hope. The chart on the right shows the behaviour of the same routes after adjusting the length of the Asia–Europe services so as to simulate their passage through the Suez Canal.

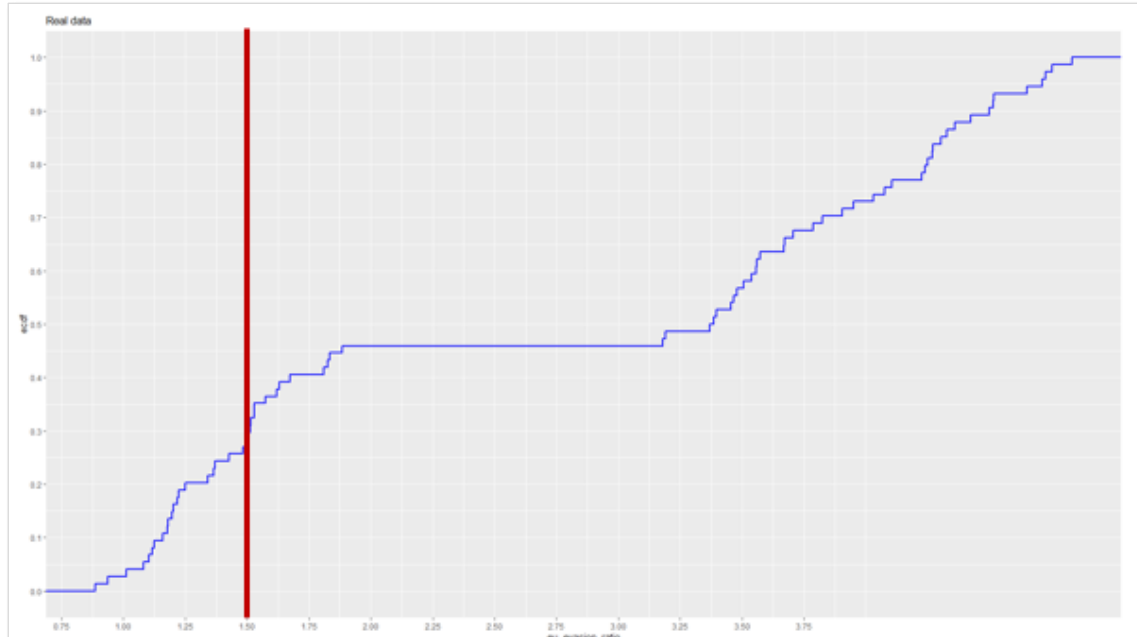


In the histogram on the right, which simulates passage through the Suez Canal, the evasion ratio varies continuously between 0.75 and 3.25. By contrast, in the histogram on the left, the range of variation of the evasion ratio widens from 0.75 to 5.0, with no routes displaying evasion ratios between 2 and 3. The widening of the range and the gap identified in the distribution can therefore be attributed to the disruption caused by the closure of the canal. This disruption has increased the average evasion ratio and, consequently, the likelihood that routes may be reorganised to avoid the EU ETS.

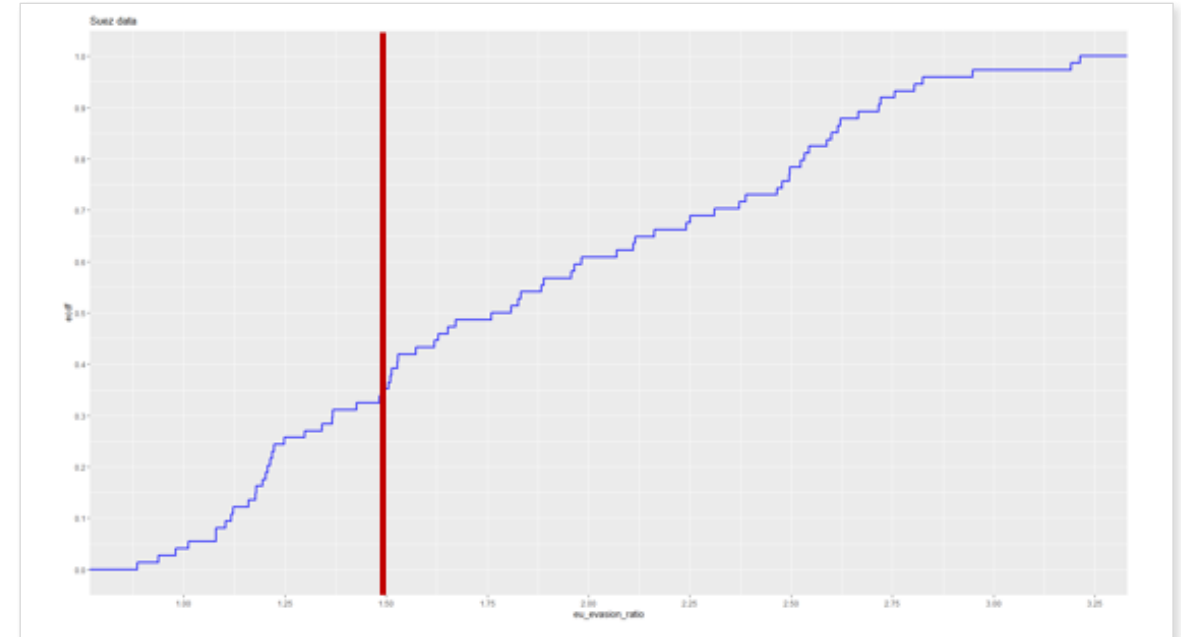
Annex I. Evasion ratio

Cut-off value selection

Based on the analysis of current data and simulation results, a threshold of 1.5 has been established, indicating that cost savings are 50% higher than the additional costs when an extra stop is made before entering and after exiting the European loop. This threshold reflects the need for a margin that accounts for operational uncertainties, such as delays, port congestion, and carbon price variability, ensuring that only robustly profitable avoidance strategies are considered viable.



Cumulative histogram of the number of routes as a function of the evasion ratio. Original route dataset.



Cumulative histogram of the number of routes as a function of the evasion ratio. Simulated Suez Canal dataset

Annex II. The carbon leakage risk ratio

Cost of splitting a maritime service

- *Cost of splitting a maritime service* = $Port_{fees} + Cost_{handlings,transshipment}$

$$Cost_{(handlings, transshipment)} = C_{nonEU} \cdot (1 - T) \cdot Q \cdot TEUS - (HC_{EU} - HC_{nonEU}) \cdot T \cdot Q \cdot TEUS = 5 \cdot TEUS \cdot Q$$

Variable		Assigned average value
Carbon price (€/tCO2)		75
Q	%of the vessel's capacity used	0.9 (90%)
T	% of cargo from EU transshipment to non-EU Transshipment	0.4 (40%)
1-T	% of cargo from EU Import/Export to non-EU Transshipment	0.6 (60%)
HC_{EU}	Handling cost in EU ports (€/TEU)	100
HC_{nonEU}	Handling cost in non-EU ports (€/TEU)	45
Port_{fees}	Port call cost (€)	60000

Assumptions on cargo volumes:

- **Slot utilization rate:** Vessels do not operate at full capacity, but at Q= 90% of their nominal capacity.
- **EU import/export ratio:** only part of the cargo, corresponding to (1-T)=60%, has its origin or destination in ports located within the area served by the EU hub port.
- **Pure transshipment ratio:** The remaining share of cargo, T=40%, is assumed to be intended for transshipment to other regions. Such transshipment may take place either at the EU hub port or at an alternative hub port located in a neighbouring third country.

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List of Acronyms

Acronym	Definition
AIS	Automatic Identification System
CAPEX	Capital Expenditure
CBER	Consortia Block Exemption Regulation
CETS	EU ETS Compliance Cost
CFUEL	Fuel Cost
COMTRADE	United Nations International Trade Statistics Database
CPPI	Container Port Performance Index
CTAX	Carbon Tax Cost
DS%	Deep-Sea Percentage/Share
EEA	European Economic Area
EMSA	European Maritime Safety Agency
EU ETS	European Union’s Emissions Trading System
EUA	European Union Allowance
GHG	Greenhouse Gas
GT	Gross Tonnage
IMF	International Monetary Fund

List of Acronyms

Acronym	Definition
KTM	Thousand Metric Tonnes
LSCI	Liner Shipping Connectivity Index
MRV	Monitoring, Reporting and Verification
OPEX	Operating Expenditure
PP	Percentage Point
RoW	Rest of the World
TEU	Twenty-foot Equivalent Unit
THC	Terminal Handling Charges
ULCV	Ultra Large Container Vessel
UNCTAD	United Nations Conference on Trade and Development
VLSFO	Very Low Sulphur Fuel Oil

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About the EU ETS Observatory

Puertos del Estado



- The European Union Emissions Trading System (EU ETS), recently extended to maritime transport, poses significant challenges for European ports. The requirement for shipping companies to purchase emission allowances may lead to route shifts toward non-EU ports, impacting the competitiveness, connectivity, and logistical sovereignty of the Spanish port system.
- In this context the Spanish organization **Puertos del Estado** has launched **the EU ETS Observatory**, an initiative whose aim is to analyse, forecast, and quantify the impact of this regulation on maritime traffic, carbon leakage, and emissions generation.
- Its objective is to support decision-making and anticipate potential adverse effects, contributing transparency and objective data to the ongoing review of the European regulatory framework.



ETS Observatory

Collaborating Companies

